No. 4. *October.*

PAGE
Explorations in Patagonia. By Dr. Francisco P. Moreno 353
A Trip to the Chinese Shan States. By Fred. W. Carey 378
Submarine Gullies, River Outlets, and Fresh-water Escapes beneath the Sea-level. By Henry Benest, ASSOC. M. INST. C.E. 394
The Antarctic Climate. By Henry Arçtowski 413
Was Australia discovered in the Sixteenth Century? By Edward Heawood, M.A. 421
Oceanography. By Sir John Murray, K.C.B., F.R.S., D.SC., LL.D. 426
The Monthly Record 441
Correspondence 451
Geographical Literature of the Month 451
New Maps 467

MAPS AND ILLUSTRATIONS—
River Fenix, now overflowing to the Atlantic and Pacific Oceans 355
Cordillera of the Andes, North-west and West of Lake Buenos Aires .. 357
Peninsula San Tadeo, at Lake Nahuel-Huapi 359
Lake Vidal Gormaz, formed by Alluvial Fans in the South-western Arm of Lake Nahuel-Huapi 361
Mount Tronador, in the Main Chain of the Cordillera 363
Volcanic Tuff at River Limay 365
Volcano Lanin, from the Valley of the Malleco 367
Wood of *Araucaria imbricata* 371
View of the Yuan Chiang Valley from Mo-Lang-Po 379
The Great Rapid, Red River 380
The Red River at Hsiukai 381
The Chang Lo-Ping Suspension Bridge over the Ho-Ma River 383
The Suspension Bridge over the Papien River 385
Manhao 386
Sumao from the West 387
Temple near Sumao, containing large gilt Burmese God 389
Tibetans in Market at Sumao 391
South Gate Street, principal Business Thoroughfare of Sumao 392
Lines of Soundings across Gully 14 and 15 N.M. from Cape Verde .. 396
Rovuma Bay, East Coast of Africa 397
Profile Sections and Soundings across Gully at Cape Verde 399
Section to True Scale across Gully at Cape Verde 400
Fosse de Cap Breton 405
Continuation of the Fosse de Cap Breton 406
The Subterranean Course of the Garonne 407
The Swatch of No Ground 410
Salinas Landing, Montery Bay, California 411
Barometric Pressure Diagrams, Figs. 1–3 414–416
Sketch-Map of the Chinese Shan States, or Sip Song Panna 472
Charts: Contour of Sea Bottom 472
Bathymetrical Chart of the Oceans 472

No. 5. *November.*

The Antarctic Expeditions. By Sir Clements Markham, K.C.B., President of the Royal Geographical Society of London 473
The Geographical Cycle. By William M. Davis, Professor of Physical Geography in Harvard University 481
Contributions to the Geography of Lake Urmi and its Neighbourhood. By R. T. Günther, M.A., Magdalen College, Oxford 504
Notes on Glaciers of South-Eastern Alaska and Adjoining Territory. By Otto J. Klotz, Canadian Topographical Survey 523
The Swedish East Greenland Expedition. By Dr. A. G. Nathorst 534
The Seventh International Geographical Congress 537
Geography at the British Association, Dover, 1899 546
On the Physical and Chemical Work of an Antarctic Expedition. By J. Y. Buchanan, F.R.S. 552
The Oxford School of Geography 559

PAGE
The Monthly Record .. 560
Obituary .. 572
Correspondence .. 574
Geographical Literature of the Month .. 576
New Maps .. 590
MAPS AND ILLUSTRATIONS—
Figs. 1–3, illustrating Geographical Cycle .. 486, 492, 494
Main Street, Ardishai .. 507
Sunnite Tower, Salmas .. 509
Panoramic View of Plain of Urmi .. 511
View of Lake Urmi from Spring on Koyun Daghi .. 514
Bridge over the Safi Chai, Maragha .. 518
Tomb of the Mother or Daughter of Hulagu at Maragha .. 519
Panorama of Muir Glacier .. 525
Panorama of Johns Hopkins Glacier .. 527
Looking westerly, Johns Hopkins Glacier to right .. 529
Looking northward of Lituyu Bay, showing one Ice-front .. 531
Brady Glacier, Taylor Bay .. 533
Map of the Urmi Lake Basin .. 592
Maps of the Glaciers of South-Eastern Alaska .. 592
Sketch-Map of the Buchanan Bay, Bache Peninsula, Princess Marie Bay, Region of Grinnell Land .. 592

No. 6. *December*.

Opening Address, Session 1899–1900. By the President .. 593
Travels in Bokhara. By Willy Rickmer Rickmers .. 596
New Light on some Mediæval Maps. By C. Raymond Beazley, M.A. .. 620
Regions of the Benue. By Lich H. Moseley .. 630
Mr. Jenner's Expedition from Kismayu to Logh, on the Juba .. 637
Recent Journey from Shanghai to Bhamo through Hunan. By Captain A. M. S. Wingate .. 639
International Oceanographical Research .. 646
Bartholomew's Physical Atlas.—A Review. By Hugh Robert Mill, D.SC., F.R. MET. SOC. .. 649
Three Recent Books on China.—Review. By Geo. G. Chisholm, M.A., B.SC. .. 652
'The International Geography.'—Review. By Major L. Darwin .. 656
The Monthly Record .. 658
Correspondence .. 672
Meetings of the Royal Geographical Society .. 673
Geographical Literature of the Month .. 674
New Maps .. 691
MAPS AND ILLUSTRATIONS—
Balgnan .. 597
The Yakh-su Valley and Conglomerate Mountains, from the Pass between Khovalin and Saripul .. 599
A Side Valley of the Yakh-Su .. 601
Ruy Dasht, on the Safet-Darya .. 604
The Russian Colony of Safet-Darya .. 605
Dandushka-bend .. 607
A Gorge .. 609
Safet-Darya Valley, with Hazrat-Ishan .. 611
Hazrat-Ishan .. 613
A Barrier .. 615
Pedigree of the Beatus Maps .. 624
The St. Sever Map .. 627
Route-Map from Shanghai to Bhamo .. 643
Chart showing the Proposed Regions for International Oceanographical Research .. 647
Sketch-Map of Bokhara .. 696
Sketch-Map of the Western District of the Benue River .. 696
Sketch-Map of the Course of the River Juba .. 696

The

Geographical Journal.

No. 1. JULY, 1899. Vol. XIV.

ADDRESS TO THE ROYAL GEOGRAPHICAL SOCIETY.*

By Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President.

The year that has been completed since our last anniversary will be memorable in the annals of our Society for two events, which, though in very different ways, will become important landmarks. The first is what I hope will prove the crowning of the edifice of our educational policy, by the establishment of the School of Geography at Oxford. The second is the generous and patriotic gift by our associate, Mr. L. W. Longstaff, whereby our antarctic enterprise was converted from a weary up-hill struggle to what Lord Torrington and Admiral Colomb would correctly describe as an expedition "in being."

If we succeed in training all our travellers to do valuable scientific work during their wanderings, and if at length we leaven educational establishments of our country with thorough geographical teaching, this Society will indeed have performed a great national service. In the first part of this work I believe that we are making steady progress. The system of instruction under Mr. Coles continues to be a pronounced success. During the past year sixty-two intending travellers have received instruction in practical astronomy in the Society's observatory and in surveying with the theodolite, prismatic compass, and plane-table in the country. This year our diploma has been received by eleven of these students, after successfully passing an examination. Altogether sixteen diplomas have been granted, ten of the recipients being officers in the army, and two officers in the navy. This is our most important educational work, because it has the most direct bearing on our special objects. The presentation of prizes on board the training ships *Conway* and *Worcester* was designed to stimulate interest in

* Read at the Anniversary Meeting, June 5, 1899.

geographical research at a much earlier age. The results since 1882, when the prizes began to be given, have been most satisfactory. Not only is great interest taken in this fascinating subject by the boys themselves, but careful attention is given to their instruction, and the head master of the *Worcester* writes an excellent special treatise every year for the use of the cadets, on the region that has been selected for the subject of examination. It is early to look for practical results in the subsequent careers of our prize cadets, yet one of them has already reached the threshold of an unknown region, and is eager to plan a more thorough exploration.

The policy of the Council, with regard to the promotion of general geographical education, has been modified since 1897. Then we contemplated the establishment of a School of Geography in London; but it was found that, for several reasons, such a plan was impracticable. We then turned to Oxford, believing that one of our ancient seats of learning would offer the best locality, certainly the most fitting locality, for such an institution as we desired to see established. Accordingly I submitted a proposal for the creation of a School of Geography at Oxford, under the joint control of the University and the Society, with expenses shared by the two bodies. My plan was favourably received by the Vice-Chancellor, and by the other authorities whose concurrence was necessary, and an arrangement has now been arrived at which, I believe, will have satisfactory results. Our Society agrees to pay £400 a year, and the University agrees to grant a like sum, towards the expenses of an Oxford School of Geography. It will be under the superintendence of Mr. Mackinder, subject to the supervision of a joint committee consisting, in addition to the Vice-Chancellor, who will have a seat *ex officio*, of four members of the University and three members of our Council. Mr. Mackinder, as University Reader, will lecture twice a week during the three terms, and will also have special classes for advanced students. There will be an assistant who will lecture on physical geography, will hold classes five times a week, and will teach surveying and cartography; and there will be two lecturers, one on certain branches of physical geography, and one on ancient geography. It is expected that undergraduates will attend one or other of the courses of lectures, for already upwards of a hundred undergraduates attend Mr. Mackinder's lectures. It is intended that a diploma shall be granted to students who complete the course, and there will be one or two scholarships of £60. These will be inducements to graduates to spend a year in mastering the principles of geography, and the knowledge required for teaching the science and for making it practically useful. The upper floor of the old Ashmolean building at Oxford has been set apart for the purposes of the School of Geography, and an annual sum will be devoted to the supply of books and appliances.

The deplorable neglect of geography in our public schools is due to

the want of competent instructors, to an absence of appreciation of the importance of geography, and to the system of competitive examinations which has proved to be the great enemy of education and learning. We see the consequences in the geographical ignorance of public men leading to serious mistakes, to risks of war, to refusals of help to useful enterprises; and in the failure of economists, merchants, and others to understand the questions they have to consider in their more important bearings, owing to absence of appreciation of their geographical aspects. We hope that the new School of Geography will, in the course of time, be a remedy for this lamentable neglect of one of the most essential branches of a liberal education. We look forward to our public schools being leavened by a new generation of masters well instructed in the principles of geography, and to new generations of public men whose geographical education will not have been neglected. The great success of our efforts to prepare travellers for the work of exploring, justifies our expectation that when the means of learning are once supplied at Oxford, there will be no lack of desire to avail themselves of it, not only among students in the University itself, but throughout the country. For I wish it to be known and understood that all students will be welcomed at the School of Geography, whether attached to the University or not. It will be the only institution of the kind in the kingdom.

The Council has agreed to continue its contribution to the salary of the reader at Cambridge for another term of years.

The Geographical Association has persevered in its useful labours with a view to promoting and assisting geographical teaching. Mr. Andrews and Mr. Dickenson, under the auspices of the Association, have been devoting themselves to the production of an excellent set of slides illustrating in colour the physical, political, and commercial geography of the continents, the British Isles, and the British Colonies. These slides have been very carefully designed by men who have an intimate knowledge alike of geographical facts and of teaching requirements; and I hope that their educational value will be appreciated, and that they will be extensively used in schools. Numerous orders have, I understand, been already received for them.

Among the agents for disseminating geographical knowledge, our own library and map-room take a prominent place. With regard to the subjects catalogue, the laborious task of entering all the geographical works in the library, including articles and papers in periodicals, has at length been completed. The cards now number 100,850; while the title of every new book, pamphlet, or article is published in the *Journal* and added to the collection of card titles. This means an addition of about 2000 titles every year, a figure which gives some idea of the immense volume of geographical work which is being done in all parts of the world. The collection and writing of these titles is a simple

matter compared with their classification, so as to form a subject index to the library. The cards for all accessions since 1893 are kept fully classified, while the classification of the rest is making steady progress. The great advantages of the card catalogue have been fully demonstrated in the practical work of the library during the last two years. Many Fellows of the Society have expressed their satisfaction at the rapidity with which they have been supplied with references to the literature of the subject of their studies.

The thanks of the Society are due to our librarian for the way in which he has carried through the difficult and heavy work of the subjects catalogue, and for the amount of thought he has bestowed on the complicated questions connected with the classification. We have also to thank Mr. Heawood, not only for the large share he has taken in this very toilsome labour, but also for his valuable contributions to our *Journal*. Mr. Heawood is an accomplished geographer, with an almost unequalled knowledge of the literature of African geography especially. I very much regret that the Society has lost his services for the present, except as a contributor to the *Journal*, but I trust that before long we shall again have the benefit of his valuable co-operation.

The increased use that is made of our library and map-room proves that it is not only our numbers that are increasing, but also the intelligent interest that is taken in our science; and that a far greater number of the Fellows have become students of geography than was formerly the case. While in the year from May, 1895, to April, 1896, the number of Fellows borrowing books was 732, during the twelve months just elapsed the number amounted to 992. But for every one who comes to the library to borrow books, two at least come to consult them. So that geographical information, during the past year, has been supplied directly to fully 3000 persons. In addition to those who come to the library, a considerable number of Fellows and of the general public apply for information by letter, which is always supplied when it falls within the scope of the Society's very wide definition of geography.

In the map-room there has been similar activity in the supply of information, the number of inquirers having increased from 2230 in 1896–97 to 3223 during the present year. Of these 79 came specially to consult the Ordnance Survey Maps.

It had often occurred to me that it would be a great advantage to geographers, and that it would tend to make the narratives of explorers more clear and accurate, if an authoritative list of geographical terms, with definitions, was drawn up for their use. The subject was brought to the notice of the Council by our former Secretary, Colonel Jackson, in 1834. His view was that the adoption and promulgation of a definite and comprehensive system of nomenclature would raise geography to the rank of a positive and exact science. The time now seems to me to

have arrived when Colonel Jackson's valuable suggestion might usefully be adopted. A Nomenclature Committee has accordingly been formed, and a list of 1300 geographical terms has been prepared by Dr. Mill. They have been placed under different headings, and have been distributed among experts for revision and additions, after which they will be more widely distributed for further suggestions. In this way I hope that, before very long, we shall be in a position to suggest a convenient and systematic geographical terminology. At the same time we shall be able to complete a list of obsolete terms, to indicate what words are to be invested with definite technical meanings, and to fix those meanings. I have so often felt the want of help of this kind myself, that I cannot doubt the value it will prove to others.

Turning from our efforts to facilitate and advance the cause of exploration to the work in the field during the last year, I think that there is room for congratulation. In Central Asia Captain Deasy, who was last heard of at Kashgar, has discovered the source of the river Khotan. In Africa good progress is being made in the more thorough work which succeeds the first pioneering discoveries, and prepares the way for that accurate triangulation, the importance of which was impressed upon us by General Chapman at the International Congress in 1895. In the presentation of the medals this day, we have shown how very highly we estimate the value of the scientific labours of distinguished French geographers in Africa. Besides Captain Binger and M. Foureau, who have received the Royal awards, we welcome the return of Major Marchand from his remarkable journey across Africa, the scientific results of which cannot fail to be very important. Our own explorers have not been idle. Colonel Macdonald has just returned from the expedition which he made into the country lying to the north of Uganda, between Lake Rudolf and the Nile. He and the able officers who served under him have done a considerable amount of new geographical work. For the first time the west shore of Lake Rudolf has been accurately laid down by Captain Austin; while Colonel Macdonald himself, the late Captain Kirkpatrick, and other officers, have added many new features to the map of the region they have explored.

Captain G. E. Smith, another officer of Engineers, has placed at the Society's disposal one of the most important pieces of work that have been accomplished in Africa in recent times. It consists of the maps embodying his triangulation of the country from Mombasa to Mount Elgon. This triangulation must form the basis of all future cartographical work in that part of Africa. The valuable survey completed by Captain Close and Captain Boileau in the country between Lakes Nyasa and Tanganyika, for the purpose of fixing the boundary between German and British territory, was executed in concert with a party of German surveying officers. The results have already been submitted to the Society, in the very interesting paper read by Captain Boileau

at one of our recent evening meetings, when Mr. A. L. Wallace also communicated to us an account of his thorough exploration of Lake Rukwa. Further north Captain Wellby, who has already done good work in Tibet, is making his way southwards from Abyssinia, into an almost unknown region of the greatest geographical interest, including the valleys of the upper Sobat and its tributaries. The map of the Blantyre highlands, and the well-executed chart of Lake Nyasa, show that the officials in British Central Africa are diligently engaged on useful surveying work.

I confidently anticipate valuable geographical results from the expedition under Mr. Moore, which recently started for Lake Tanganyika, having received a grant of £600 and a loan of instruments from this Society. The lake itself will be sounded and dredged, the surrounding region will be examined, and geographical work of importance will be done to the northward. An expectation is entertained, not without good grounds, that the investigations of Mr. Moore's expedition will furnish a clue to the physical history of this part of Central Africa. For when a sufficient amount of reliable data has been accumulated by labourers in the field, we look for well-founded generalisations from the leaders of geographical research.

We have recently had a remarkable example of the use that may be made of the work of travellers, in the very able conclusions of Colonel Church, embodied in his admirable address to the geographical section of the British Association last year. He generalized on the physical history of a large area of South America, by piecing together the facts collected by himself and by many other travellers during their exploring work in the field. Much more information is needed by geographers from that most interesting of the partly unknown continents, although a great deal of good work has recently been achieved by South American explorers. Don Francisco Moreno, whose presence in this country on work connected with the Chile-Argentine arbitration, has enabled us to become better acquainted with some parts of his country of which we scarcely knew anything before, has done an immense amount of valuable geographical work. He has explored the eastern slopes of the Patagonian Andes, and discovered numerous alpine lakes, and he surveyed the lofty region of the puna of Atacama; while the museum at La Plata, under his auspices, is an institution where explorers are trained and instructed, and whence geographical information is disseminated. The remarkable journeys of Sir Martin Conway in South America have shown us how much may be done by a keen and instructed observer in a short time. His triangulation of the western slopes of the Cordillera Real from Sorata to Illimani, valuable as it certainly is to cartographers, is not more so than his admirable descriptions of the mountains and of the region round La Paz. His attempted ascent of Mount Sarmiento in Tierra del Fuego is a remarkable feat, and is the first

effort that has ever been made to explore the mountains and glaciers of that southern extension of the American continent. No doubt it will not be the last.

The polar regions are receiving more and more attention, because they contain the largest unknown areas in the world, and also by reason of the specially valuable scientific results to be derived from their exploration. There is not yet any news of the American and Norwegian expeditions which have proceeded up Sir Thomas Smith's sound, led by Peary and Sverdrup, with the object of discovering the northern side of Greenland; nor can there be any intelligence of Mr. Wellman, who wintered in Franz Josef Land, until the autumn. But His Royal Highness the Duke of Abruzzi has sailed in the Norwegian whaler *Jason*, re-named the *Stella Polari*, with the glorious cry of "Northward ho!" and, without knowing his special object, for we have not been informed, we bid him heartily "God speed." I hope that British arctic enterprise is not altogether a thing of the past. If it is, we wish all possible success to the friendly emulation of our brother geographers without fear of rivalry. The combined nations of the world will never approach the achievements of Britons in the arctic regions, for all there is left to do is not a tithe of what has been completed under the Union Jack.

The southern polar region is now the great object of our efforts; and I desire particularly to ask your attention to the various aspects of antarctic enterprise, but before doing so we must glance at the proceedings of the Belgian expedition, of that sent out by Sir George Newnes, and at the work of the *Valdivia*.

In August, 1896, the *Belgica* was being strengthened and fitted out at Sandefjord, in Norway. She is a small vessel of 250 tons, built of pine at Drammen about twelve years ago. I visited her with her commander, M. de Gerlache, and saw that the new work was being thoroughly well done, including an outer coating of greenheart. Passing the evening with M. de Gerlache, I was impressed with his knowledge of the subject, and with his youthful enthusiasm. I also saw one of his young assistants, M. Arçtowski, and did what I could to further his wishes. The others were M. Danco, who took the magnetic observations; M. Racovitza, the biologist; and Dr. Cook. The gallant adventurers were resolved to do all that was possible in the cause of science, with very limited means which caused delays. It was not until January 14, 1898, that the *Belgica* was able to leave the Straits of Magellan, and shape a course for the South Shetlands. M. de Gerlache has an excellent deep-sea sounding apparatus on board, and seven soundings, with serial temperatures, were taken between Staten island and Bransfield strait. On the 24th Hughes bay was reached, and M. de Gerlache reports the discovery of islands, which he named the Palmer group, and Danco land. Here M. Racovitza collected an insect and a spider, the first of the antarctic land fauna, if, indeed, the South Shetlands

are to be considered antarctic, as well as lichens, mosses, and grasses. On February 12 the *Belgica* entered the Pacific ocean, and steered for Alexandra Land, but was unable to approach it; and on the 28th she was in lat. 70° 20′ S., and long. 85° W. Here M. de Gerlache entered the polar pack, and succeeded in reaching 71° 31′ S., in long. 85° 16′ W. On March 3, as no further progress could be made to the south, the *Belgica's* head was turned northwards, and she bored through a very close pack for 7 or 8 miles; but on the 10th she was finally beset, at a distance of 60 or 70 miles from the edge of the pack, and obliged to winter in it, the sun being absent from May 17 to July 21. The position was 71° 36′ S., in long. 87° 39′ W. As this is the first time that any one has ever wintered in the antarctic regions, the more complete and detailed account of the movements and appearance of the ice throughout the winter months will be extremely interesting. The isolated explorers had the misfortune to lose one of their number, Lieut. Emile Danco, by death on June 5. On the other hand, they were fortunate in the great number of seals and penguins that frequented the neighbourhood of the ship, and enabled them to ensure the preservation of health by a diet of fresh meat. In the spring small openings and channels began to appear in the ice, which was 3 to 6 feet in thickness. During three months all hands were hard at work at a canal to reach open water—a consummation which was attained on March 14 of the present year. The *Belgica* was only once subjected to any pressure from the ice during the winter. On March 28 she returned safely to Punta Arenas. Valuable series of observations were registered throughout the winter, and collections were made from various depths. The expedition of M. de Gerlache will be memorable in the annals of polar exploration alike for its valuable results, and for having been the first that ever wintered within the Antarctic Circle.

Another antarctic expedition was organized by Sir George Newnes and despatched last autumn. A vessel named the *Pollux*, built at Arendal, was purchased and fitted for the work in Norway. She is manned with a crew of twenty-five men, including two mates, two engineers, and a master named Jensen. Her name was changed to the *Southern Cross*. Sir George Newnes informs me that the clothing and provisioning of the expedition received the most careful attention. Mr. Borchgrevink was appointed leader of the landing party and scientific staff, which consists of Mr. Colbeck, R.N.R., and Mr. Louis Bernacchi as magnetic observers, Mr. Evans and Mr. Hansen as zoologists, Dr. Herlof Klovstad as medical officer, and Mr. Fougner as general assistant. They are thoroughly equipped with scientific instruments. The equipment also includes boats, kayaks, and sleighs for dogs, which were procured from Russia.

When the late Mr. Svend Foyn, of Tonsberg, sent the ship *Antarctic* to the southern seas for whaling purposes in 1895, her commander.

Captain Christensen, steamed through the pack and reached the coast of Victoria Land, effecting landings at one of the Possession islands of Sir James Ross, and at Cape Adare. Captain Jensen was one of the mates on board the *Antarctic*, and Mr. Borchgrevink was also serving on board. Leaving England on August 22, Mr. Borchgrevink and Captain Jensen followed the lead of Captain Christensen, and have also succeeded in reaching Cape Adare. They sighted the Balleny islands, and were forty-two days in the pack. But on February 15 last, very high snow-covered land was sighted, during a heavy gale with terrific squalls and a high sea. Next day the gale increased, and on the 17th the *Southern Cross* was anchored in 5 fathoms, at a distance of three quarters of a mile from the beach. A landing was effected on the 18th. The dogs were got on shore with the Finn drivers, and several boat-loads of stores and provisions were landed. But on the evening of the 20th there was another furious gale, the engines were worked at three-quarter speed, to ease the strain on the cables, and during the squalls the deck was actually strewn with pebbles blown from the adjacent mountains. The work of building the house and landing stores was steadily proceeded with from the 21st to the 25th, and on the 26th another terrific gale began. The starboard anchor was lost, the engines were worked at full speed, and at last a refuge was found for the ship at the south end of Robertson bay. On the 27th, three of the party set out to ascend a peak bearing south-south-west from Cape Adare, landing on a pebbly beach. They made for the peak across snow-drifts and glaciers, but were stopped by an inaccessible ice-mass after reaching a height of 2300 feet. The country inland appeared to be an immense undulating plateau covered with glaciers. On the 28th the house was completed, and Mr. Borchgrevink landed with the scientific staff, to winter on this desolate spit of land. The *Southern Cross* then returned, arriving at Port Chalmers, New Zealand, on March 16 last. It is a terribly severe climate, and some anxiety at the hardships the landing-party may be exposed to during the winter is inevitable. There is also the danger of Cape Adare being blockaded by considerable fragments of the pack, as was the case when Sir James Ross discovered it. This would make communication with the shore next year very difficult. We have no experience of men having withstood for months on shore such climatic conditions as Victoria Land presents. But we must hope for the best. The intention is to take a series of magnetic and meteorological observations, make biological collections, and to penetrate inland with dog-sleighs in the spring. Next year the vessel will return to Cape Adare to bring back the landing party. Sir George Newnes informs me that the expedition sails under the British flag, and that the Duke of York showed his interest by presenting the ship with a Union Jack.

This is a most praiseworthy enterprise on the part of a private individual. The observations cannot fail to be valuable, and all concerned

deserve our warmest sympathy for their zeal in facing great hardships and dangers in the cause of science. We cordially wish them all possible success. While M. de Gerlache and his companions are the first to pass a winter within the antarctic circle, the gallant explorers sent by Sir George Newnes are the first to winter on any antarctic land.

The admirably conducted German Deep-sea Expedition, which has just returned to Hamburg, did some valuable work in high southern latitudes, although the *Valdivia* was not adapted for ice-navigation. Leaving the Cape in November, 1898, Bouvet island was re-discovered, and a southerly course was then shaped in the direction of Enderby Land. Reaching drift-ice in 56° 45′ S., they were soon surrounded by numerous icebergs, the highest being a tabular mass rising 193 feet above the water. Further progress was stopped when they reached 64° 15′ S., in long. 54° 20′ E., where there was a depth of 3000 fathoms. It is considered that one of the most surprising results of the expedition is the great depths encountered after leaving Bouvet island. Out of seventeen soundings, no less than eleven showed depths between 2700 and 3300 fathoms. Only fifteen deep-sea soundings had previously been taken south of 50° S. The *Valdivia* added 29, and proved that the Southern ocean was of very great depth. But I consider that the most important information related to indications of the nature of the antarctic continent. These indications are found in the stones carried off the shore and dropped by icebergs. Specimens were collected of gneiss, granite, and schist; and besides, there was a mass of red sandstone weighing 5 cwt. The soundings between Enderby Land and Kerguelen island showed that the ocean floor was strongly folded, depths of 1300 fathoms alternating with great abysses between 2000 and 3000 fathoms. The conduct of the *Valdivia* expedition was admirable in all respects. Great proficiency was attained in deep-sea sounding and dredging, and the excellent manœuvring of the ship in stormy weather was a cause of immunity from loss of sounding-wire. The thoroughness and excellence of the *Valdivia's* work is a subject of congratulation to our brother geographers in Germany.

I will conclude my address with some remarks on our own efforts to secure the despatch of an antarctic expedition on an adequate scale. In my opening address, on November 13, 1893, I brought the subject prominently forward, and we then undertook the difficult task of securing the despatch of such an expedition. In winding up the discussion on Sir John Murray's paper, on the 27th of the same month, I declared that I, for one, would never swerve from that task until it was completed. Nearly six years of effort have passed since those words were spoken, and progress has been slowly but steadily made. I have not been disheartened, for it took me twelve years, with the aid of Admiral Sherard Osborn, whose loss can never be replaced, to secure the despatch of the Arctic Expedition of 1875. Yet, after working from 1862 to 1874,

and enduring several rebuffs, the Prime Minister at last declared that, "having carefully weighed the reasons set forth, the scientific advantages, and the importance of encouraging that spirit of maritime enterprise which has ever distinguished the English people, Her Majesty's Government had determined to organize an arctic expedition." These words were worthy of the representative of a great people. They received the hearty concurrence of the nation, and if such words were once more spoken by a Prime Minister the feeling would be the same, for Britain is ever true to her traditions.

It was considered by our Antarctic Committee, appointed in 1893, that the expedition should consist of two ships, and that it should be under naval discipline, and led by naval officers. This was, therefore, what we advocated, with every reason to expect that the plan would receive favourable consideration. For it was simply a continuation of the enlightened policy of many successive governments during nearly a century and a half. When Commodore Byron's instructions were drawn up in 1764, the government of that day declared that "nothing can redound more to the honour of this nation, as a maritime power, to the dignity of the crown of Great Britain, and to the advancement of its trade and navigation, than to make discoveries of countries hitherto unknown." This noble policy was adopted by successive administrations, and upwards of forty government expeditions have since been sent to the polar regions. This country can proudly point to the results. The early voyages to Spitsbergen led to the great fishery in the surrounding seas. The first voyage of Sir John Ross showed the way into the north water of Baffin's bay. The third voyage of Sir Edward Parry pointed out an equally lucrative fishery up Prince Regent's inlet. Other results might be enumerated. But suffice it to say that polar expeditions have directly led to the enrichment of this country by millions of money, to enabling numerous communities along our seaboard to live in well-to-do comfort, to the employment to a large class of industrious men, and have formed a splendid nursery for our sailors. Their scientific results are at least equally noteworthy. Without a knowledge of the geography of the polar regions, including their hydrography and meteorology, we should still be ignorant of numerous phenomena which influence other parts of the globe. For the world must be studied as a whole, because each region influences surrounding regions, and if large areas remain unknown, even those areas which are known cannot be understood from a scientific point of view. It is the same with every department of science; and magnetism, geology, botany, and biology have all largely benefited from polar research.

But it was not solely from the desire of increasing knowledge and advancing trade and navigation, that the policy of employing our navy on voyages of discovery in time of peace was adopted and continued. Those objects were recognized as sufficient in themselves, but successive

generations of our statesmen also saw the great value of exploring expeditions to the navy itself, for offering opportunities of distinction, for acquiring experience in the exercise of faculties which are of most value to seamen, and for securing active employment out of the stagnating ordinary routine of the service. These I know were the views of the best naval friends of polar research in times past, such men as Sir Henry Hotham and Sir George Cockburn. Remember, too, the words of one who loved the navy dearly, our associate Sherard Osborn. "It is by the action of public opinion," he urged, "directed by the men of science in this country, that I hope to see a polar expedition sent forth under naval auspices. The navy needs some action to wake it up from the canker of prolonged peace. Polar exploration is more wholesome for it, in a moral as well as a sanitary point of view, than any more petty wars with savages. You are not going to educate us, work us up to the point of nautical perfection, awaken hopes and ambitions, and then keep down the aspirations which intellectual progress has evoked. The navy of England cries not for mere war to gratify its desire for honourable employment or fame. There are other achievements, it knows well, as glorious as victorious battles; and a wise ruler and a wise people will be careful to satisfy a craving which is the life-blood of a profession—indeed, I hold that it ought to be fostered and encouraged." Many of us will remember the words of Admiral of the Fleet, Sir Edmund Commerell, himself a brilliant disciple of Sherard Osborn, on the occasion of our Franklin commemoration. He said, "My experience of over fifty years in the service has taught me that you can look nowhere for better officers, in the ordinary run of duty, and better seamen, than in these polar expeditions. We know very well that they have been an excellent school in every way; above all, an excellent school in hardihood." He brought forward Sherard Osborn himself as an example. "He was always forward and untiring in polar expeditions, so when it came to war, there was Osborn in the forefront. I believe, in the future, that polar work will not cease, as I am perfectly certain it is the best school we have for our navy."

Well! with all this evidence of its value and importance before us, it was natural that we should look forward with some confidence to a favourable consideration of our representation to the Government in favour of a naval antarctic expedition. We were, however, disappointed. It was considered that officers could not even be lent, because they might be out of reach of the telegraph if they were required. This is not the opinion of such an authority as Admiral Sir Vesey Hamilton, who was recently first Sea Lord of the Admiralty. "The maritime supremacy of Great Britain must be founded on a quicksand," he said, "if she cannot spare a few officers to enable her to maintain her supremacy in maritime discovery." We might perhaps have waited until this more

truly *naval* opinion prevailed. The additional objection on the ground of expense was received by us last year; and I knew, from experience, that these were not necessarily, or even probably, final replies.

But there were very strong reasons for avoiding further long delays. Chief among them was the fact that a German expedition, amply supplied with funds by the Government, would certainly undertake exploration in the antarctic regions, and that the Germans had invited us to co-operate and act in concert with them. Under such circumstances it would be a disgrace to this country if she held back; resigning her old position in the van of discovery. It was, therefore, resolved to make an appeal for funds to the Fellows of the Society and to the public. That appeal has already met with a noble response from many well-wishers, but far above all from Mr. Longstaff, whose munificent and patriotic action has enabled us to secure the equipment of a small though efficient expedition. It is, however, most important that others should follow this splendid example. For upon the raising of a considerably larger sum depends, not only more adequate arrangements, but also the duration of the exploratory operations for a sufficient time.

The Royal Society and the Royal Geographical Society are working in perfect unison in this matter; and a joint committee, composed of equal numbers of both societies, has been nominated by the respective councils, to conduct all the business connected with the antarctic expedition. There will be sub-committees to consider and deal with the several departments of work. We still hope that there will be assistance from Her Majesty's Government, both as regards leave for officers to serve and as regards a grant of money. For we look to the various precedents afforded by several private expeditions which have occasionally stepped in to perform work which has usually been undertaken by the Government. Among them may be mentioned Back's land journey, the expedition of the Rosses, when the magnetic pole was discovered, M'Clintock's expedition to discover the fate of Franklin, and Sir Allen Young's expeditions. Treasury grants were made to three of these private expeditions; in fact, whenever asked for, assistance in various ways to others, and naval officers were allowed to serve in all. So that the refusal of a supplementary grant or of the services of naval officers would be unprecedented. There is, I am glad to think, every reason to hope that it will remain so.

Hitherto antarctic exploration has been naval work, and there are peculiar difficulties when it is forced upon scientific bodies. It is outside their ordinary duties, and they have necessarily entered upon it with a serious sense of the responsibility it will entail. Yet there was really no alternative, and the Royal Society and Royal Geographical Society, with the warm sympathy of all the other scientific bodies of the empire, have combined to organize and despatch an expedition. It is in no sense a private expedition; its objects are precisely the same as

those of the polar expeditions so often despatched or subsidized by the Government, while its national and representative character are emphasized by the Prince of Wales having become its patron and the Duke of York its vice-patron. I cannot conclude my address without warmly thanking the subscribers among the Fellows, and representing to those who have not yet subscribed how much the credit not only of the Society, but of the country, is involved in the provision of adequate funds for this great national enterprise.

EXPLORATIONS IN THE BOLIVIAN ANDES.*

By Sir MARTIN CONWAY.

Before proceeding to describe in briefest outline the results of my expedition to the Andes in 1898, let me express in the most emphatic manner my thanks to the Governments of Bolivia, Peru, and Chile, for the facilities they placed in my way. Armed with the kind recommendation of Señor Aramayo, the able Bolivian minister to this country, I was received by his fellow-countrymen with open arms, and all ways were made for me as smooth as it was possible to make them. Our honorary Fellow, Señor M. V. Ballivian, was my good genius in La Paz, where, moreover, in the much-to-be-regretted absence of any British diplomatic representative, I was kindly protected by the French *Chargé d'affaires*, M. de Coutouly, and the United States minister, Dr. Bridgman. The Peruvian Government admitted my baggage free of duty; whilst the Chilian Government placed at my disposal in the Straits of Magellan a steamer, which enabled me to make the explorations I desired. To our own diplomatic representatives, Mr. Gosling at Valparaiso and Mr. St. John at Lima, I owe very hearty thanks for their great kindness; whilst at Punta Arenas Mr. Meredith, our vice-consul, extended to me a warm hospitality, and gave me valuable help.

Accompanied by two Alpine guides, Antoine Maquignaz and Louis Pellissier, I left Southampton early in July, and voyaged by the Royal Mail steamer to Colon; crossed the isthmus of Panama, spending a week in that neighbourhood; then sailed down the west coast of South America to Callao, where I took the opportunity of a four days' halt to mount by the Oroya railway to the crest of the Andes, and obtain a glimpse of the snowy range in the neighbourhood of the pass. From Callao I proceeded to Mollendo, and so by way of the Arequipa railroad to Lake Titicaca, that remarkable sheet of water fourteen times the size of the lake of Geneva and 12,600 feet above the sea, which is to be regarded merely as a remnant of a far greater inland sea now shrunk away. A steamboat took us down the lake, a voyage of 111 miles, on

* Read at the Royal Geographical Society, May 8, 1899. Map, p. 128.

a brilliantly clear and beautiful day. We passed the historic islands from which the Inca civilization is reported to have spread, and we saw the noble Mount Sorata rising in white splendour apparently from the waves. At Chililaya we transferred ourselves to a four-horse vehicle, locally known as a tilbury, and drove to La Paz by a good road which traverses the high level plateau called the Puna. During this drive of some 30 miles we were passing below the feet of the wonderfully straight range of snowy mountains called the Cordillera Real, whereof Mount Sorata forms the northern extremity, and Illimani, 64 miles away, the southern. It was this range that I had specially come to visit. I do not propose to give a merely chronological account of our doings during the four months we spent in this part of Bolivia. A concise statement of the general results of our work will probably be more interesting to this Society. I may remark that I triangulated the principal peaks of the range from Sorata to Illimani, and made a plane-table sketch survey of their western slope, and of the Puna and the valley of La Paz. But this map cannot be published at the same time as my paper, seeing that I hope to be able to correct and add to it by a second visit to the country.

The Cordillera Real is the backbone of Bolivia. To the east the mountains fall very rapidly to a low hill country and the fertile valleys which send their waters to the river Beni. I unfortunately saw little of this side of the range, and it is thither I hope to return. On the other side there lies the high plateau of which I have spoken, at a uniform altitude of 12,000 to 13,000 feet, from which the tops of low rocky hills here and there emerge. That this plateau was at one time submerged is obvious enough. The slopes that lead down to it from the main Cordillera are covered with immense accumulations of glacier-borne and water-rolled *débris*, the ruins of the range against which they lie. Evidence is plentiful that in ancient times the glaciers enveloped a large part of these slopes, and reached down many miles further than they now do, depositing the rocks that they carried into the waters of the ancient sea. What the limits of this glacier extension may have been, it is difficult now to estimate, for there are proofs that the glacier-deposited *débris* have been much torn about and rearranged by water. But a very minute examination would have to be made before the exact extent of this process could be estimated. In the immense pile of *débris* deep valleys were afterwards cut by the action of water, and into these valleys the glaciers in a second period of advance protruded their snouts, depositing moraines which can still be traced *in situ* as much as 4 or even 5 miles below the present limit of ice. One such glacier-cast was carefully examined by me near the foot of Mount Sorata. The terminal moraine now forms the dam of a large lake, 500 feet above the level of whose waters the two lateral moraines can be traced with perfect distinctness. At the north-west foot of the

same mountain, where the mule-track goes over from the Puna to Sorata town, the whole area is glacier-worn and encumbered with moraines; whilst in the deep Maperi valley, whose head lies against the north face of Mount Sorata—a valley now absolutely devoid of ice, and occupied up to the very foot of the mountain with almost tropical vegetation—the marks of glacier-action are of the most striking character. These are merely examples amongst the many that might be quoted from different parts of the range.

The climate of the plateau region is of importance in connection with its present physical formation. A great part of the year is completely rainless, but from the beginning of December till the end of March or April rain is precipitated very frequently and with great violence. During the remainder of the year the slopes and plains are swept by dry winds, and sometimes scorched by a very hot sun, so that, except at very high levels of perpetual snow, where bad weather lasts over a longer period, the surface of the whole country is dried and baked. In the rainy season mud avalanches fall down the slopes, gullies are deepened, every stream is in flood, waterways are ploughed in various directions in the plain, and all the rivers eat their way back. The great dryness of the land, when the rain begins, facilitates the rapid action of denudation, so that surface-modelling by water is perhaps as vigorously carried on here as it is in any part of the world.

That this is no modern development is proved by an examination of the range as a whole, for it is cut through, or is being cut through, at its two ends by profound excavations, and, curiously enough, that happens here which is also a characteristic of the Kara Koram Himalayas—the gaps are deepest close to the highest summits. Thus, just south of Illimani, a tributary of the Beni river has eaten its way back and back, and finally has cut clean through the Cordillera, so that now the streams that rise on the west slopes of all the southern half of the Cordillera Real, uniting in the La Paz river, actually flow across the Cordillera, through the deep gorge thus eaten back, and empty their waters into the Beni, the Amazon, and the Atlantic. A similar process is going on north of Mount Sorata, where the Maperi river has already got halfway through the range, and is now busily engaged in eating backwards at its head, so that in no long geological period it will cut back to Lake Titicaca, and will ultimately empty that out, likewise, into the Amazon and the Atlantic. All that remains now for it to pierce is the relatively low ridge over which the road to Sorata Town passes, and its crest is less than 2000 feet above the level of the lake, while the distance from Achacache, which is on the margin of the lake, to the pass is perhaps some half-dozen miles. More striking examples of the eating-back action of rivers it would be difficult to find.

In a former paper read by me before this Society, I pointed out how there are indications in Spitsbergen of glaciers eating back at their

heads, just as rivers do; and I suggested that the agency of glaciers was probably that which causes the penetration of ranges of mountains to happen so frequently in the immediate neighbourhood of their highest peaks. Whether the mountain ridge south of Illimani and the other north of Sorata were broken down by the backward eating of glaciers, or whether it is water-action that destroyed them, is of course not easy to assert; but upon Illimani I observed a glacier at the present moment eating its way back through a secondary ridge in a manner that could not possibly be misinterpreted. The ridge that was giving way formed the right-hand support of a considerable glacier. The side of

A BALSA ON LAKE TITICACA.

this ridge remote from this upper glacier forms a cliff, at the foot of which there is a lower glacier, and the lower glacier, by continually carrying away the *débris* split by frost and sunshine from this face, causes the face to retreat into the mountain. The process continually going on has breached the ridge itself at one point down to the level of the glacier supported by it, and now the ice which formerly would have flowed down the upper glacier, is just beginning to break away and tumble over the cliff to the lower one. Allow this process to go forward for a short time, and the whole configuration of the mountain will be changed.

It seems to have been the general impression that, though the

western flank of the Cordillera Real consisted of Silurian rock, the peaks of the range were of volcanic formation, and I have often seen Sorata and Illimani referred to as extinct volcanoes. As the result of a careful examination, not only of those peaks, but of the *débris* brought down by the glaciers all along the range, I have been unable to find any trace of volcanic action along the axis of the range. The Cordillera Real has been elevated by a great earth-movement, and the heart of the range consists of granites, schists, and rocks of that description, which Prof. Bonney has kindly undertaken to examine and describe. A transverse section across the range would reveal a central block of such rocks cloven by almost vertical pressure-planes flanked, to the west by Palæozoic, probably Silurian, slates and grits, with which some compact igneous rocks, not belonging to the later volcanic group, seem to be associated. These dip steeply towards the Puna. Further out come beds of red sandstone and conglomerate dipping less steeply. Such, in broad outline, is the comparatively simple general structure of the mountains.

The whole range may be described as rich in mineral products, but of the distribution of these I cannot at present say much. Gold is found at several points, but the chief gold-bearing valleys are those on the east side of the range, and more especially the Tipuani and Coroico valleys. Gold is found in the La Paz river after every rainy season, whilst very rich gold-washings are being worked in a valley whose waters come from the flanks of Mururata. Just below the snowy mass of Cacaaca on the west, there is a really enormous vein of tin, which is being worked by a French company; whilst antimony, cobalt, and, I believe, platinum, have been found in different parts. The great copper deposits are not in this range, but further to the west, especially about the town of Corocoro.

The Cordillera Real between Sorata and Illimani divides itself into two fairly well-marked parts. The point of division is Mount Cacaaca, which stands almost exactly midway between the two terminal peaks, and is third in altitude of the whole group. Between Sorata and Cacaaca there runs an almost continuous series of snowy peaks, some of them sharp in outline; but the range for the most part has been much worn down by denuding action, and the individual mountains have thus been brought to a form very similar to that of the snowy Alps. Almost every one of the mountains reminded me and my Alpine guides of some peak or another familiar to us in Switzerland, so that in conversation we used to talk of one peak as the Rothhorn, of another as the Dent Blanche, etc. The passes in this part of the range seldom sink below the snow-level, though there is certainly one, and there may be two passes, a little north of Cacaaca, which are free of snow in the summer. South of Cacaaca the range is much less continuously lofty. There are three or four big groups of snow-peaks, but between them

are broad stretches where the range does not rise to the level of perpetual snow, and over these lie passes, some of which may be traversed by mules, whereby La Paz is connected with the fertile region of Yungas. Indeed, I understand that there is a proposal to make a railway over one of these passes, and that the physical difficulties to be surmounted, though of course considerable, are by no means prohibitive. I approached several of the passes over the range, but did not actually cross any of them, and therefore cannot describe them. Suffice it to say that it would be quite easy to make good routes for mule traffic across the range at several points, and that such routes, communicating

MOUNT SORATA, FROM THE PUNA.

with the rich country to the east, would materially develop the wealth of the country.

South of the great gap, by which the La Paz river traverses the ancient watershed, the main range is continued, though at a much lower altitude. There is one attractive group of snow-peaks called "The Five Crosses," but they rise very gradually from the high region about them, and it is only their actual summits that are at all steep. They have been ascended more than once, for the most part by persons prospecting for minerals, and certain mineral deposits of a promising nature have been found in their slopes, though not, I believe, towards their summits. We made no attempt to penetrate into this portion of

the range, though I had good views of it from the flanks of Illimani and from the plain to the eastward.

The flora of the high regions of the Cordillera Real appeared to us very sparse, though it is only fair to say that the rainy season must be the time when the flowers are most numerous, and as we quitted the country before the actual commencement of the rains, we probably only encountered the earlier flowers; of their general character I do not propose to speak, for they have been investigated at Kew Gardens, and the results will find their proper place for publication elsewhere. Suffice it now to say that the flowers we found were much scattered about, one here, another there, but that we never came across any carpet of blossoms such as form the great attraction of many high mountain regions. Bird-life was more prolific. Leaving the Puna and the lake out of account, where birds have formed the subject of independent investigation by experienced observers, it may be said that up to an altitude of 17,000 feet, in suitable places, birds were numerous, and in a little tarn close to our base camp on Mount Sorata, at 16,000 feet above the sea, we shot geese, gulls, wild duck, and snipe, besides several small birds; and we saw a number of rather large green-headed humming-birds, of which, unfortunately, I was unable to secure specimens through lack of suitably loaded cartridges. The slopes of broken rocks beside this place were haunted by multitudes of bizcachas, which seemed to thrive exceedingly. Chinchillas we did not see, but from scraps of fur I picked up, it seemed possible that they also might have been found in the same neighbourhood.

Except at La Paz and Sorata Town, the inhabitants of the Puna and the banks of Lake Titicaca were almost entirely Aymara Indians. By them the Puna is densely populated. They cultivate almost every yard of it by their primitive methods during the rainy season, and they obtain tolerable crops of çevada and potatoes. Potatoes, in fact, are one of the chief articles of food that the country produces. There are many varieties cultivated, and they are afterwards prepared for food in a multitude of ways, so that potatoes for food are met with in over a hundred different kinds. Some are put out at night to freeze, and taken in before the morning sun brings on a thaw; some, on the other hand, are dried in the sun and taken in at night to be sheltered from the frost; some are wetted and frozen, and some are dried and frozen, and there are multitudes of other modes for preparing potatoes for the market. The Indians are practically attached to the soil for the most part, and hold their lands by a kind of feudal tenure. Instead of paying a rent, they give their labour to the landlord, cultivating his fields as well as their own, but only according to their traditional systems of agriculture, by which a field is cultivated once in four years and lies fallow for the remainder of the time, whilst at the highest levels of cultivation the turn of a field comes even less frequently.

So long as no attempt is made to interfere with their traditional modes of life, and they are not oppressed by the landlords or their administrators, the Indians are quiet enough; but they are never well disposed to white men, and the difficulty of keeping them in order is not slight. Bolivia does not possess a large military force or an organized body of country police, for the area to be policed is large, and the white population is very small. Thus the Indians are kept in order more by management than by force, and the great agency of control is not the police, but the priests. The Indians are an exceedingly bigoted folk, retaining under a mask of Christianity their ancient superstitions, little altered. I was seriously interfered with in the prosecution of my

MOUNT CACAACA, FROM NEAR MILLUNI MINE.

researches by Indians, because the nature of my undertaking involved some outrage to their superstitions. Like all semi-civilized mountain folk, they regard the mountains above the level of habitation as a part of the other world, the world of divine and diabolic beings, and the haunt, I believe, of the departed. It was firmly held by the Indians of the Puna, and especially of that part of it which lay round the base of Mount Sorata, that on the summit of one of its peaks there stands a great golden bull and a golden cross, planted by supernatural agency. They considered that the object of my expedition could be nothing else than to obtain possession of these priceless treasures. For this reason partly, and partly through the hostility of the Indians of a neighbouring

village to those of the village whence the porters who accompanied me to the base of the mountains were recruited, my camp at the foot of Mount Sorata was raided one night, and if we had happened to be in at the time, things might have gone hardly with us. As it was, we were then encamped in our small tents among the snow, and the snowy areas are not visited by the natives.

Again, during the progress of my triangulation, it was essential for me to spend some time on the top of a hill that rises out of the Puna in the neighbourhood of a village of particularly bigoted Indians. On this hilltop there stands a *chulpa*, a little building probably enough of pre-Spanish date, which now would be called a chapel, but is really the funeral monument of some departed chieftain. All the lower and more accessible hilltops in this part of Bolivia are surmounted by such chulpas, and the natives greatly dislike their profanation by the visits of strangers. At all events, I had no sooner set up my theodolite near the *chulpa*, than the Indians began collecting from all quarters, till I was surrounded by more than two hundred enraged natives. I was alone at the time with one half-breed muleteer, and it was only by the skin of my teeth that I ultimately escaped, abandoning in the hands of the Indians the theodolite, which I fortunately had just time to pack up in its box, and riding away pursued by a stone-throwing and howling mob. I found that they could run almost as fast as my indifferent mule could gallop, and the four miles' chase that ensued before I got within the walls of the town of Achacache was not the least exciting adventure I had in Bolivia. It was necessary to return again to this point to conclude my observations, and, though I went back accompanied by persons having influence with the Indians, I was only just able to complete my work and get down from the hill before the stone-throwing began once more. Attempting to continue the survey on the following day, I found the whole country risen against me; it became necessary to obtain the assistance of a company of soldiers before I could complete my task. These Bolivian soldiers, with whom I spent several days, were an admirable set of fellows, very strong, good tempered, and the best marchers I ever saw. They kept up a kind of trot for hours together across the roughest kind of ground, each man heavily laden, and under burning sunshine. But there seemed no limit to their powers of endurance, and there is little doubt that with good leading they would make formidable troops.

Of the antiquities of Lake Titicaca and the neighbouring plateau I need not here speak, for the important ruins—those on the island of Titicaca and the neighbouring island of Coati, and the famous megalithic monuments at Tiahuanaco—are well known, whilst the chulpas and the ruined villages and ancient burying-places of the prehistoric natives are now being most carefully excavated and investigated for the Washington Museum by Mr. Bandelier and his wife. It is impossible to overpraise

the work of Mr. Bandelier, whom I may best describe as the Flinders Petrie of ancient Peru. Not only does he dig into the ground, but he makes researches equally important into the minds of the living folk; he is thus slowly accumulating a mass of material of the highest interest alike to anthropologists and historians. When I met him, he was engaged in excavating the burial-place and the ruined houses of a village planted high up on the slopes of Illimani. Indeed, there are indications of prehistoric habitation and agriculture on Illimani at a very much higher level than the villages of the present day. One such ruined village was planted at the very edge of a small glacier, and was

EARTH-PYRAMIDS IN LA PAZ VALLEY.

only reached by a footpath, difficult and even dangerous to traverse. In the burial-places of this ancient peasantry were, of course, found no treasures of silver and gold, but only simple pottery and a bronze pin or two, besides some stones of peculiar shape, which the existing Indians, who helped in the excavation, instantly recognized as fetiches. The second time I met Mr. Bandelier, he had been digging a ruined village of more prosperous character near the town of Sicasica. The mud huts were still standing, in many cases retaining their mud roofs, and each with its little doorway towards the east. Beneath the floor of those huts were buried generations of their bygone inhabitants, just

as Prof. Petrie found in the Egyptian village of Kahun and elsewhere. The skulls of all the adult natives presented the characteristic of a very retreating forehead, artificially produced in childhood, but one interment fortunately yielded the skull of an infant in perfect preservation, whose form, unaltered by artificial means, was proof that the peculiarity of the others was not natural, but artificial.

If the Cordillera Real shows slight traces of volcanic activity, the outer or coast Cordillera shows plenty. Standing high upon the slopes

GORGE NEAR CUSANACO MINE.

of Illimani or of Sorata, we could always see, away to the westward, mountains of unmistakable volcanic type. Indeed, in coming from Mollendo to Lake Titicaca, we passed round the base of the large and famous Misti, which rises to a height of 19,000 feet. On its summit the observatory of Harvard College established at Arequipa has a station, fitted with self-recording meteorological instruments, and every fortnight a man goes up to bring down their records. Further to the south, and along a line parallel with the Cordillera Real, other

volcanoes may be observed at frequent intervals. It was my intention to visit Sajama, and if possible climb it on my way down towards the sea; but the difficulty of getting together a caravan proved too great, and I was reluctantly obliged to relinquish the plan. Sajama is nearly the highest of a group of extinct craters which would well repay careful examination. Further south along the line of the railway that descends from Oruro to Antofagasta, volcanoes are frequently met with. In fact, the whole country is rich in the signs of volcanic activity. Two smoking volcanoes are passed by the train. At one point the line is taken by a cutting actually through a stream of lava, which looks as

ILLIMANI, FROM NEAR CAIMBAYA.

though it had been quite recently erupted, so sharp are its outlines, as it lies upon the desert slope. It resembled to my eyes nothing so much as the tongue of a great stone-covered glacier. The whole of this region from Oruro to the sea, with the exception of a few areas artificially irrigated, is an appalling desert, not valueless by any means, for in great hollows of the ground there are white borax deposits that look like lakes frozen over and covered with snow. The mineral wealth of the mountains is undoubtedly considerable. This region has, I believe, been fairly well prospected for minerals, but geographically it stands in need of, and would well repay, a careful examination. In point of scenery it resembles nothing so much as a landscape on the moon,

whilst for weird beauty and strangeness it can find, even in the midst of the Sahara, no superior and few rivals upon the face of the Earth.

After leaving Bolivia, I spent a few days in making the ascent of Aconcagua.* It was not, of course, a first ascent of that fine mountain, for, as everybody knows, it was ascended by Mr. Vines and my old Himalaya guide Zurbriggen, members of Mr. E. A. Fitz Gerald's expeditions in 1897. Mr. Fitz Gerald was an old friend of mine. I had followed his proceedings with the deepest interest, read all he had written on the subject, and conversed with him about the mountain before leaving home. He had urged me to make the ascent, and had given me all the information possible to facilitate it. My ascent of Aconcagua was not a scientific, but a merely sporting expedition. The mountain had been measured by Fitz Gerald with greater accuracy and care than almost any other high mountain in the world has ever been measured. He had also fixed its position astronomically with great exactitude, and had mapped the peak and its neighbourhood most beautifully. When his book comes out, the public will learn, as they do not yet know, how excellent was the work done by Mr. Fitz Gerald's party. When I returned from my ascent, after only ten days' absence from Valparaiso, the opinion of

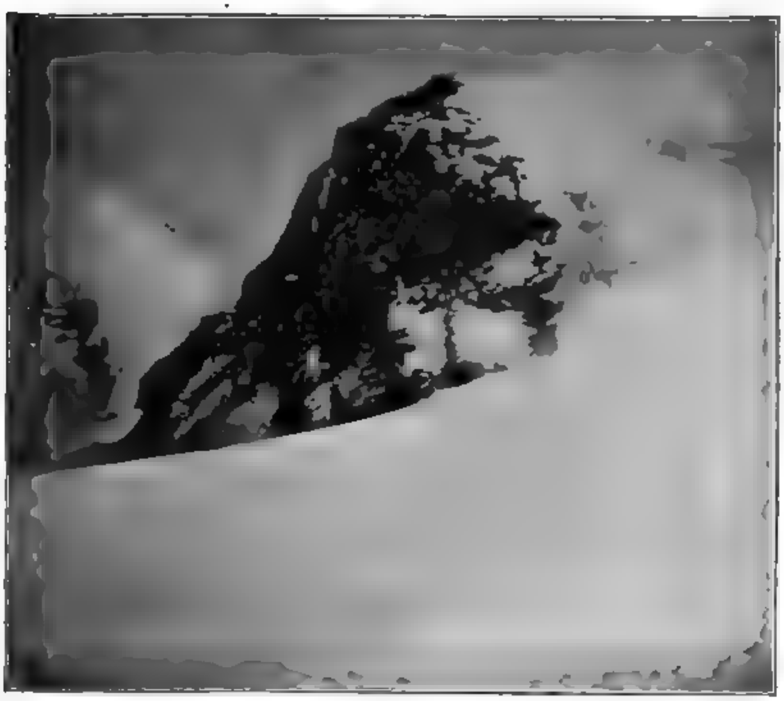
---

* Left Valparaiso December 1; crossed the Andes to Baths of Inca, December 2. December 3, rode up Horcones valley and camped at the head of it, about half a mile below Fitz Gerald's 14,000-feet camp. December 4, sent baggage up to site of Fitz Gerald's 16,000-feet camp. December 5, ascended to 16,000-feet camp. December 6, ascended to about 18,500 feet, and camped near the south edge of the great north-western slope of screes. We thought this was Fitz Gerald's top camping-place, because we found an old duster there, but it must have been brought by wind. December 7, started at 3.30 a.m. up the screes, following thence forward a line of ascent different from Fitz Gerald's. At 7 a.m. Pellissier turned back ill. Between 9 and 10 a.m. reached foot of second or third gully (counting from north-east to south-west) in the highest rock-wall. Climbed this gully to the summit ridge, which was struck between the highest peak and the lowest point in the summit ridge. Turned to the left (north-east) along the narrow snow *arête* towards the highest point, and climbed over several undulations to the top of a peak near, and not many feet lower than, the highest peak. It was then about noon.

There was absolutely no difficulty between this point and the highest peak, though the ridge thus far had not been easy. All difficulties being thus overcome, and the ascent not being a first ascent, I decided to descend, for two reasons: (*a*) because it was advisable to get back to Pellissier as quickly as possible: (*b*) because Vines, when he ascended Aconcagua, made a record for altitude, and I thought it likely that, if I reached his peak, I should be accused of mere jealousy, whereas if, after overcoming all the difficulties of the mountain and being within ten minutes of, and at the very outside 50 feet below the highest point, I turned back, I could not be so accused.

At noon exactly we turned back and went down the way we had come. Reached top camp in two and a half hours. Found Pellissier badly frost-bitten, and realized that it was essential to get him down to mule-level at once. Descended with all baggage in forty minutes to middle camp; packed that up, and descended in forty minutes to foot of slope, fifteen minutes to Fitz Gerald's 14,000-feet camp, fifteen minutes to our base camp, which was reached at 6 p.m. December 8, descended with all baggage to Inca. December 9, sent off baggage for Valparaiso. December 10, started at 5 a.m., crossed the Cordillera, and reached Valparaiso at 11 p.m.

uninformed persons was that I had in some fashion surpassed the exploits of my predecessors, who spent seven months or more on or about the mountain. To begin with, had they not preceded me, I should probably have wasted the best part of a month in searching for the way, which is by no means obvious. Again, the time actually spent by them on the ascent was little longer than that taken by me. Each of their camps was a well-fitted observatory; at each they made long series of observations. The mere determination of the position of the Inca Hotel, from which they started, as I did, took them a month or more. They



ILLIMANI AND THE PICO DEL INDIO.

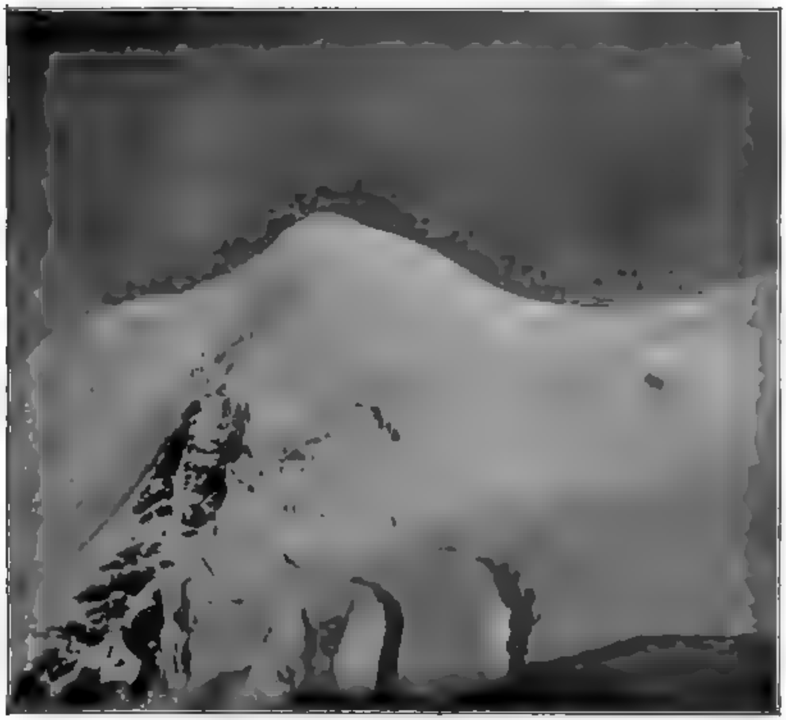
made a complete examination of the geology and natural history of the neighbourhood. Thus my climb cannot be compared with their expedition in any way, and I am the last to desire any comparison between the two to be made. If, hereafter, the summit of Mount Sorata is attained by some more lucky climber than I was, he will owe to me the same recognition that I gladly render to Fitz Gerald.

After returning from the ascent of Aconcagua, I took ship at the southern extremity of the Chilian railroads to Lota, the famous copper and coal mine centre. Passing southward along the west coast in the steamer, we entered Smyth's sound at the Gulf of Peñas. A few days

were spent in the sound, where I was, fortunately, enabled to land at several points and make short expeditions into the neighbouring mountains, and then by the Straits of Magellan I came to Sandy Point, where I halted for a few weeks. During that time, by the kindness of the Chilian Government, a steamboat was placed at my disposal, and I was enabled to attempt the ascent of Mount Sarmiento, the highest and finest mountain in the Fuegian district. I also made an expedition over the Patagonian Pampa to some of the secluded inland waters that long ago attracted me when I first studied them on the Admiralty chart. To this part of my expedition I can only now briefly refer. The character of the scenery of Smyth's sound closely resembles that of the inland passage along the coast of Norway. In both cases, the mountains are formed of hard rocks, granites, schists, and the like; in both these rocks have been polished for long periods by an ice-sheet, which has rounded the valleys and the summits and apparently enveloped the whole range; in both cases the mountains have passed through periods of elevation above the sea, and then of depression into it; in both cases they have been depressed in the more recent period, so that the valley-bottoms are sometimes as much as 1000 feet below the level of the sea; and in both cases this period of depression seems now to be passing away, and the land is being raised once more above the waters. Smyth's sound enjoys a higher reputation for beauty of scenery, but this reputation is, I think, greater than it deserves. Certainly, in point of beauty, the Norwegian inland passage is its superior. Smyth's sound lacks variety of scenery. At one or two points, indeed, there are specially fine views—as, for instance, below the fine promontory named Bold head, or where Trinidad channel opens to the west, disclosing a multitude of beautiful islands, or beneath the snow-clad Cordillera Sarmiento (not to be confused with Mount Sarmiento of Tierra del Fuego), or where the majestic mass of Mount Burney rises by the channel. But in a general way there is a dead level of scenery, fine indeed, but not of surpassing grandeur.

The characteristic of the views is the dense forest which covers the lower slopes of all the hills and islands—a primæval forest of stunted trees, rising out of the ruins of their predecessors, which are rotting and tangled together on the ground, thickly overgrown by moss, offering to the traveller every possible impediment. Higher up, in situations naturally well drained, the forest is more open, and there are occasional bogs occupying the sites of former ponds or lakes, and barren areas of polished rock too steep for earth to collect upon; whilst the tops of the hills are sometimes faced by precipices, and are themselves often relatively bare of vegetation when they do not reach to the level of perpetual snow. Looking inland up the numerous channels which open out from the sound in succession, one often beholds snowy areas, great gathering-grounds of snow, drained by glacier tongues which sometimes terminate in the water. If it were not for the bad weather that infests

this flank of the submerged mountain area, these regions would offer a fascinating subject for a mountain explorer. As it is, I fear they are not likely to attract minute investigation until the more agreeable mountains of the world have been better explored than they are now. The western arm of the Strait of Magellan offers far more splendid scenery to the contemplation of the voyager than does any except the southernmost part of Smyth's sound, but this has been so frequently described that I need not pause upon it now.



TOP OF ILLIMANI, FROM THE PICO DEL INDIO.

I was surprised to find how splendid are the mountains of Tierra del Fuego, which culminate in Mount Sarmiento. It is not that they are actually high, reckoned from sea-level, for Sarmiento is only a little over 7000 feet, but they are so unusually fine in form, and are draped by such magnificent glaciers. The actual height of a mountain, as measured from the sea, is not a true test of its size. Mount Sorata, for example, really begins at 13,000 feet; all that is below, it possesses in common with the great tableland on which it stands, and it is not till about 16,000 feet that the actual peak begins. Illimani, on the other hand, stretches its slopes down to the very depths of the valley

of La Paz on the one side, and to the lowlands of Yungas on the other, so that it is seen from base to summit—a mighty mass, whose top is at least 17,000 feet above its foot. Mount Blanc is practically a mountain no more than 10,000 feet high, though its summit is nearly 16,000 feet above sea-level; while if the Alps were sunk into the sea till all that part of them were submerged which may be traversed without real climbing, there is hardly a peak that would rise 5000 feet above the surface of the waters. Mount Hedgehog, in Spitsbergen, is only about 5000 feet in height, but every one of those 5000 feet has to be climbed, and, as a problem for the climber, Mount Hedgehog is more difficult than most Alpine peaks. The 7000 feet of Mount Sarmiento are all difficult of ascent, and the climb may be said to begin near the very level of the sea, so that the snowy mass of Sarmiento is larger than that of Mount Blanc, and almost as large as that of Mount Sorata. Here again we were under the impression that we should find traces of volcanic action, but we found none. Mount Sarmiento, and the range of which it forms a part, has been upheaved by a great earth-movement, and carved out from a vaster mass by the action of denuding forces. Much further to the eastward I believe volcanoes do exist on Tierra del Fuego, but the ranges which border the Cockburn channel or Admiralty sound are devoid of traces of volcanic action.

The climate of the Mount Sarmiento region is by no means so bad as that of Smyth's sound. Though we were unfortunately driven down before actually reaching the summit of the peak, by a storm of great violence, which it was impossible to maintain ourselves against, I think that here is an area in which mountain exploration might be carried on with some prospect of reasonable enjoyment, and with the certainty of obtaining valuable results. The arrangement of the ridges, except those that border Beagle channel, is not yet by any means clear. A great part of the island of Tierra del Fuego which is marked blank on the map, is occupied by mountains, whilst the glacier development is considerable. An examination of these glaciers led me to conclude that, in character, they must be placed between the truly arctic glaciers, such as we saw in Spitsbergen, and those of temperate regions. They have much of the apparently greater viscosity of arctic glaciers, pouring down their slopes and bulging at their snouts very differently from the glaciers of the Alps. The most remarkable glacial feature that we saw was a rocky basin of great extent, just at the foot of the north slope of Mount Sarmiento, filled by the great supply of *névé* that comes down that slope, and overflowing in three different directions, to east and west and north, where three separate tongues of ice find their way almost into the sea. One of them, by which we mounted, is only separated from the sea by a narrow belt of forest-clad moraine, and it is evident that, not so long ago, the snout of the glacier must actually have reached the water. But, as I explained in connection with the glaciers of

Spitsbergen, a glacier ending in shallow sea must sooner or later build in front of its snout a wall of moraine, which must ultimately cut it off from the water. Such moraine walls, dividing glacial snouts from the sea, were found by us in several places in the neighbourhood of the Sarmiento range. Our examination of this district was of course very cursory, but to me it is intensely interesting, and I hope that, before many years, some better-equipped mountaineer will find himself in those parts, and will devote a whole season to the exploration of the glaciers. Sandy Point is now developing into a town of considerable importance, where all necessary commodities can be obtained, and where, at the right season, a traveller would be able to hire boats and engage companions.

Before the reading of the paper, the PRESIDENT said: This evening we have the pleasure of welcoming here again Sir Martin Conway, who has given us so much interesting information in regard to such distant parts of the world as the Himalayas and Spitsbergen. Now we are to hear from him some of the results of his very interesting journey to South America.

After the reading of the paper, the following discussion took place :—

Señor ARAMAYO, the Bolivian Minister: A few nights ago, under this same roof, I had the pleasure of congratulating Sir Martin Conway on the wonderful success of his ascents of the highest peaks of the Andes, and of thanking him, as I do now again, for the most complimentary manner in which he has referred to my country and to myself. I am sure that his lectures will have a great part in bringing Bolivia into closer connection with the scientific and commercial world, and he may be assured of the esteem and gratitude of my fellow-citizens. I thank you, Mr. President, for giving me the opportunity of acknowledging our indebtedness to Sir Martin Conway, and I take this opportunity of congratulating the Society on this addition to their succession of triumphs in the cause of science.

Prof. BONNEY: I am sorry to say that since I received Sir Martin Conway's rocks I have only been able to afford the time to give them a cursory examination, but I have seen enough to perceive that he has settled one question which, up to the present time, was a matter of doubt. Various statements have been made as to what was really the nature of the Cordillera. David Forbes, in his excellent paper to the Geological Society, stated that the summit of Illimani consisted of Silurian rock. d'Orbigny said it was granitic. Now, ascending from the eastern slopes you pass a series of slates and schists, probably of Devonian and Silurian age. Above that, from the highest parts of the mountains, Sir Martin Conway has brought a series very difficult to decide upon without microscopic examination. Some are of igneous origin, but quite different from those generally found in the Andes. The Pico de Paris is a fine banded gneiss, and the Pico del Indico is of coarse granite. In the same way, Sorata consists of a series of crystalline rocks, such as you might get from the central part of the Alps. It is remarkable that the volcanic rock of the Andes is almost wholly confined to the western series of mountains. Only from one place on the lower slope of Illimani has Sir Martin brought one of the typical Andes rocks, such as have come from Aconcagua, and as Mr. Whymper has brought from the Ecuadorian Andes. The physical structure is remarkable. The crystalline rocks form the most eastern of the ranges, and it is worth noticing that the only rocks of that type were brought by Mr. Whymper from the most eastern peak of the Andes he visited in the Ecuadorian region. The origin of those gaps in

the chain is very interesting. I doubt if the case is parallel to that afforded by the Himalayas and Karakoram and by the two principal ranges in the Alps, because in both these cases we have rivers rising well behind a range, which they cut through, while here we have rivers cutting back into the plateau; that is to say, the plateau in these Ecuadorian regions is clearly a much more ancient feature than the river; while in the other two cases the rivers have always flowed in the same way, and cut down the land as it rose. It would be interesting to make out what the real history of these gaps is.

There is one more remarkable point in this region—that there is such a mass of snow and glacier. It is singular that in Aconcagua, some 1400 feet higher and 16° further from the equator, there is much less snow—Sir Martin Conway and Mr. Fitz Gerald's party, in ascending, found little snow on Aconcagua—yet here in the Cordillera are masses of snow and glacier that would do credit to the Alps. I conclude the precipitation in this district must be greater than that of the Andes further to the south. I think we may congratulate Sir Martin Conway on the extremely interesting results that have attended his exertions, and I hope we may be able to make some considerable additions to the geology of this region.

Dr. H. Woodward: I am asked by my colleagues in the British Museum to say a word about Sir Martin Conway's collections. He did not merely climb the Andes, but he has collected natural history specimens all along his route. Besides the rocks which Prof. Bonney received, there were some interesting minerals, which Mr. Fletcher has casually examined. Among these are two rare species of angelite; the former contains the rare chemical element germanium, and the latter a hydrated phosphate of aluminium. Dr. Bowdler Sharpe has received an important collection of birds, and although no species is new, some important new localities are represented, and at higher altitudes than specimens hitherto obtained. Among the insects, of which a large collection is waiting to be examined, at least there is a new Meloë, one of the curious oil-beetles, closely allied to a species obtained by Mr. Whymper at an elevation of 10,000 feet in Ecuador. From the casual examination of the specimens already made, we know that important additions will have been made to the Natural History Collections by Sir Martin Conway, and I congratulate him on the successful results of his journey.

The following communication on the botany of Sir Martin Conway's expedition was read on behalf of Mr. W. Botting Hemsley, keeper of the Kew Herbarium:—

The botanical collection made by Sir Martin Conway is almost entirely restricted to the plants found at the extreme upper limits of vegetation, and numbers only about sixty-five species. But it is an exceedingly interesting collection, and will be the subject of a paper to be read before the Linnæan Society on June 1. There are apparently no authentic published records of plants growing in the Andes at a greater elevation than about 17,000 feet. Humboldt cites only two plants—a gentian and a lobelia—growing on Chimborazo at an elevation of 15,973 feet. Subsequently, Brongniart published a saxifrage, *Saxifraga Boussingaulti*, from the same peak, discovered at an elevation of 16,236 feet. This was supposed at the time to be the highest point at which a flowering plant had been found in the Andes. Curiously enough, so far as we know, this plant has not been collected by any traveller except the one whose name it commemorates. In the Kew Herbarium are several plants from the Andes labelled as having been found at altitudes of 17,000 to 18,000 feet; but these records are probably not quite exact. The district visited by Sir Martin Conway had been previously very thoroughly botanized by Weddell, Mandon, and others, and the first-named botanist's 'Chloris Andina' is the most important work in existence on the flora of the Andes. The author records only eight species of flowering plants from a greater elevation than

5000 metres (16,400 feet), and only one definitely from so great an elevation as 5200 metres (17,056 feet); though he has been falsely cited as recording a composite (*Culcitium canescens*) from an elevation of 5900 metres, or 19,352 feet. Sir Martin Conway's collection contains at least half a dozen species of flowering plants from elevations of 18,000 feet and upwards, the highest being from about 18,500. They include a saxifrage, a mallow, a valerian, and several plants of the natural order Compositæ. It is noteworthy, in this connection, that members of the same natural order attain the upper limit of phanerogamous vegetation in Tibet, where, in lat. 30° to 34°, one was found by Dr. Thorold at 19,000 feet. Sir Martin Conway's collection has not been thoroughly worked out yet, but it probably contains no previously unknown species. It is, however, none the less interesting, and botanists are greatly indebted to him for the trouble he took in forming it.

Colonel Church: I think the evening is getting on, but I might say a few words with reference to Sir Martin Conway's paper. I have listened to it with great pleasure, for he travelled over a great deal of ground which I myself visited. I know of no grander sight along the line of the Andes than the Cordillera which is flanked on the north by Illampu, and on the south by Illimani; you have a line of snow-peaks above 100 miles in extent, and these viewed from the coast ridge, looking eastward across the Titicaca plateau, form a mountain range which perhaps has no equal in beauty in the world. That plateau of Titicaca is merely the alluvium and detritus from the great Silurian Cordillera which I have just mentioned; it has a thickness of from 2000 to 2500 feet, and through this the La Paz river has carved its way. I am disposed to differ from Sir Martin as regards the La Paz river cutting back from the Amazon side of the Cordillera; on the contrary, I am inclined to believe that when Lake Titicaca was much higher than at present, the La Paz river broke through the inland range, cutting a gorge about 600 feet in depth, which it has worn slowly down to its present level in the deposits of the basin of clay, shingle, and gravel and large rounded boulders. The amount of detritus or alluvium which the La Paz sends through that gorge in a year is prodigious; it pours it down into the plains of the Beni river. I recollect well one picture—a house on the La Paz river, in a little gorge on the southern flank of the Illimani, and I saw it under most delightful circumstances, embowered in fruit trees, vines, and roses; and looking up the gorge 14,000 feet above the point where I stood, I could see the shimmering, flashing peak of Illimani rising in a sheer slope uninterrupted by a single hill, in all its glory and magnificence, and I remember saying to myself, "The man who scales that pinnacle will be a bold one." I congratulate Sir Martin Conway on having been that man.

The President: We have to thank Sir Martin Conway for many things. I have seldom listened with greater interest to a paper, not only because of the surprising quickness with which Sir Martin Conway in all these travels has taken in the important features of the country, and the character of the physical geography, but also on account of the admirable way in which he has described this magnificent scenery, so that the beautiful slides he has shown us have actually been coloured by his pictorial words. It is a great pleasure to us here to receive such an account of a country which has never before been described to this Society. We had a very interesting paper on Bolivia by Mr. Minchin, now many years ago, but he did not cover this ground. I have listened with great interest to the comments which have been made on the paper by Prof. Bonney and Dr. Woodward, who have shown us the great value of the geological specimens brought home, and to the account given us by the gentleman from Kew of the botanical collection. With regard to the *flora* of the loftier Andean region, I have myself collected tola (*Baccharis Incarum*), which I believe to be a composita, at a height of 17,200 feet in the Andes,

and I would speak in favour of the climate of these great heights as affecting the *flora*—perhaps not such a height as that, but certainly 13,000 feet, where very beautiful trees grow, the scolli (*Bucholleia coriacea*) and the queñua (*Polylepis tomentella*), with a dark leaf light coloured underneath, and a trunk very like that of a yew tree. Large numbers of these trees grow in the cordillera, which I traversed further to the north. All these points are exceedingly interesting, and I am glad to be able to add that the triangulation which has been carried out between the peaks of Sorata and Illimani along the chain will, I believe, be most valuable in the construction of more correct maps of that country. I only hope some day Sir Martin Conway will do the same service on the other or eastern slope. I regret we have not had time to hear from him an equally interesting account of the attempt he made on the magnificent peak of Sarmiento, in the Magellan straits, but I trust, if not at an evening, yet at some afternoon meeting, Sir Martin Conway will give us an account also of that part of his journey.

I am sure you will all join with me in a very hearty vote of thanks to Sir Martin Conway.

ON THE TEMPERATURE OF THE FLOOR OF THE OCEAN, AND OF THE SURFACE WATERS OF THE OCEAN.*

By Sir JOHN MURRAY, K.C.B., F.R.S., etc., of the "Challenger" Expedition.

I. The Bottom Temperature over the Floor of the Ocean.

Our knowledge of the temperature of the floor of the ocean is derived from direct observations in the layers of water immediately above the bottom by means of deep-sea thermometers, from the electric resistance of telegraph cables resting on the bed of the great ocean basins,† and from the temperature of large masses of mud and ooze brought up by the dredge from great depths. All the temperatures recorded up to the present time in the sub-surface waters of the open ocean indicate that at a depth of 100 fathoms all seasonal variation disappears. Beyond that depth there is a constant, or nearly constant, temperature at any one place throughout the year. In some special positions, and under some peculiar conditions, a lateral shifting of large bodies of water takes place on the floor of the ocean at depths greater than 100 fathoms. This phenomenon has been well illustrated by the researches of Prof. Libbey ‡ off the east coast of North America, where the Gulf Stream and Labrador Current run side by side in opposite directions. This lateral shifting cannot, however, be called seasonal, for it appears to be due in most instances to violent storms, or strong off-shore winds, bringing up colder water from considerable depths to supply the place of the surface

* Maps, p. 128. On Map 1 the scale of colouring for the darkest blue should be $-1^{\circ}\cdot11$ C.

† Peake and Murray, *Proc. Roy. Soc., Edin.*, vol. 22, p. 409, 1899, "On the Survey by s.s. *Britannia* of the Cable Route between Bermuda, Turk's Islands, and Jamaica."

‡ W. Libbey, jun., "The Relations of the Gulf Stream and the Labrador Current," Report of the Sixth International Geographical Congress, London, 1895.

drift, so that this colder water covers stretches of the ocean's bed which, under normal conditions, are overlaid by warmer strata of water.

From the point of view of temperature, the whole floor of the ocean may be divided into two regions—

(1) A deep-water region, in which there is a constant, or nearly constant, temperature in the water over the bed of the ocean at all times of the year at any one spot; and

(2) A shallow-water region, in which the sea-bed is subject to periodical variations, or occasional variations, of the temperature through changes in the over-lying water.

The investigations recorded in this paper indicate that the first region occupies over 90 per cent., while the second occupies less than 10 per cent., of the floor of the ocean.

A. *Temperature over the Floor of the Ocean in Depths greater than 100 fathoms (see Map 1).*

In order to study the distribution of temperature in the vast deep-sea region of the ocean, all the known temperatures taken by means of deep-sea thermometers at the bottom of the ocean were, in the first instance, placed on charts, and lines were drawn showing areas where the recorded temperatures were under 30° Fahr., between 30° and 35° Fahr., between 35° and 40° Fahr., and then for every 10°, namely, between 40° and 50° Fahr., between 50° and 60°, and over 60° Fahr. In drawing these lines showing the different bands of temperature over the floor of the ocean, the observations of temperature in the intermediate depths have also been taken into consideration, and especially the lines of equal temperature at different levels, as shown in the maps published by Dr. Buchan in the '*Challenger* Reports.' *

The general results of this investigation are represented on Map 1,† where the blue and red bands of colour illustrate the temperature prevailing on the floor of the ocean in all depths greater than 100 fathoms; the blue shades of colour show temperatures under 40° Fahr. (under 4°·44 C.), and the red shades temperatures above 40° Fahr. (over 4°·44 C.).

This vast deep-sea region, which occupies 93 per cent. of the whole ocean, and 66 per cent. of the whole surface of the planet, is entirely removed from the direct influence of the sun; not only is there a constant temperature at any one spot throughout the year, but the

* See "Report on Oceanic Circulation," Phys. Chem. Chall. Exp., pt. viii., 1895.

† So far as I know, this is the first attempt to represent on a map the temperature over the floor of the whole ocean. Prof. J. Walther ("Ueber die Lebensweise fossiler Meeresthiere," *Zeitschr. d. Deutschen geol. Gesellsch.*, 1897, p. 270) gives a small diagrammatic sketch of the bottom temperature in the Atlantic basin, with a view of pointing out the contrast between bottom and surface temperatures, and a few months ago he urged me to publish a map, such as that now produced.

sun's rays are believed to be nearly all absorbed by passing through the 600 feet of sea-water by which this whole region is overlaid. So far, then, as direct sunlight is concerned, it is a region of darkness. Plant-life appears to be wholly absent from this deep-sea region, and consequently no assimilation of inorganic materials by organisms can there take place. All the animals which flourish in such abundance in the depths of the sea are dependent for their food on organic matter which has been assimilated in the surface and shallower waters of the ocean and on the dry land, where chlorophyll is present. This organic matter subsequently falls to the bottom from the surface waters, or is washed into the deep sea from the surface of the continents and the shallows of the ocean.

The first glance at the accompanying maps shows that the distribution of temperature on the floor of the ocean is fundamentally different from what prevails on the continents and in the surface waters of the ocean, and is governed by quite different laws. At the surface of the earth, both on land and at sea, bands of equal temperature run more or less parallel to the equator, as may be seen on the Maps 2 and 3, showing the minimum and maximum temperature at the surface of the sea. This is true notwithstanding the fact that oceanic currents cause wide deflections, as, for instance, in the case of the Gulf Stream, where the lines trend away to the north-east.

At the bottom of the ocean the lines of equal temperature run, on the whole, north and south, following the general trend of the continents, as may be seen by reference to Map 1. The cold water, which occupies all the greater depths, has been derived from the surface in extra-tropical regions, the greater bulk of this water having received its low temperature in the great Southern Ocean towards the Antarctic. It will be observed that the shades of red, which represent the portions of the ocean's bed covered by the warmer water, form narrow bands along continental shores and around oceanic islands, and are separated from each other by wide stretches of blue shades, which represent the cold water in the greater depths derived from the polar and sub-polar regions.

The darkest shade of blue, indicating a temperature under 30° Fahr. (under $-1^{\circ}{\cdot}11$ C.), is limited to the ice-bound regions of the Arctic and Antarctic oceans, but in the Norwegian sea it extends to the southward of the Färoe islands, where the water in the deeper part of this basin is cut off from general oceanic circulation by the Wyville-Thomson ridge. In this closed area to the north of the Wyville-Thomson ridge and Färoe-Iceland ridge, temperatures as low as 28°·9 Fahr. have been recorded in depths of 2000 fathoms.

The second or intermediate shade of blue, representing a temperature at the bottom between 30° and 35° Fahr., covers nearly the whole of the bottom in the Antarctic and great Southern oceans, and

extends throughout nearly the whole of the Indian ocean. Offshoots extend into the Atlantic and Pacific, and here and there throughout these oceans there are patches of the same colour which indicate connections with the deep waters of the great Southern ocean, or the cold ice-covered seas of the Arctic.*

The palest shade of blue, indicating a temperature between 35° and 40° Fahr., covers nearly the whole of the North Atlantic and a very large part of the Pacific. The average temperature over the floor of the North Atlantic, in depths beyond 2000 fathoms, is about 2° Fahr. above the average temperature at the bottom of the Indian ocean and South Atlantic, while the temperature of the bed of the Pacific is intermediate between these.

Passing now to the red shades in the map, which represent temperatures over 40° Fahr., it will be noticed that these are broadest within the tropics, and gradually thin out and ultimately disappear towards the north and south. The palest shade, representing a temperature between 40° and 50° Fahr., sometimes extends a considerable distance into extra-tropical regions, as, for instance, in the North-East Atlantic, where it run along the coast of Norway. The middle shade of red, indicating a temperature between 50° and 60° Fahr., occupies a narrow strip along the shores of continents and around islands in tropical and sub-tropical regions, and fills the Mediterranean; while the darkest shade, indicating a temperature over 60° Fahr., is represented by a mere line, and is almost wholly limited to the tropics, but fills up the Red sea and covers a portion of the sea-bed in the eastern Mediterranean.

In the Pacific there is, around the islands stretching from New Guinea to the Paumotus, a small strip of the sea-bottom where the temperature touches 70° Fahr. in depths below 100 fathoms, and a like temperature is found in the Red-sea and one or two places in the West Indies at depths exceeding 100 fathoms.

With the view of arriving at a more definite notion of the extent of the ocean's floor covered with water at different temperatures, the lines were transferred to equal-surface projection maps, and the areas were measured by means of the planimeter. The results are given in the following tables, where the subdivisions of the ocean adopted in the paper on the "Height of the Land and the Depth of the Sea" † have been followed. From the last table in this Section A, showing the

* As regards the temperature at the bottom of enclosed seas, like the Mediterranean, it would appear that the bottom temperature is determined, to a large extent, by the winter temperature at the surface in the locality; but in the case of some of the partially enclosed seas, as, for instance, the China sea, it is possible that the very low temperature observed at the bottom may be due to the propagation downwards of the temperature acquired by the water at the surface much further northwards, or it may possibly indicate some connection with the open ocean, which will be revealed by future soundings.

† *Scott. Geogr. Mag.*, vol. iv. p. 1, 1888.

general result, it will be seen that of 127,100,000 square miles of the earth's surface covered by the ocean in depths beyond 100 fathoms, 122,700,000 square miles, or 96 per cent., are overlaid by water with a temperature of less than 40° Fahr. (under 4°·44 C.), and that only 4,400,000 square miles, or less than 4 per cent., are covered by water with a temperature above 40° Fahr. (over 4°·44 C.).

North Atlantic (including Gulf of Mexico, Caribbean, Mediterranean, Black, North, Baltic, and Norwegian Seas).

	Square miles.
Area over 60° Fahr.	59,000
„ 50°–60° „	720,000
„ 40°–50° „	1,044,000
„ 35°–40° „	13,770,000
„ 30°–35° „	350,000
„ under 30° „	470,000
Total	16,413,000

South Atlantic.

Area over 60° Fahr.	5,000
„ 50°–60° „	50,000
„ 40°–50° „	150,000
„ 35°–40° „	6,400,000
„ under 35° „	3,200,000
Total	9,805,000

Arctic Ocean.

Area 35°–40° Fahr.	1,000,000
„ 30°–35° „	2,585,000
Total	3,585,000

Indian Ocean (including Red Sea).

Area over 60° Fahr.	105,000
„ 50°–60° „	300,000
„ 40°–50° „	540,000
„ 35°–40° „	1,000,000
„ 30°–35° „	14,400,000
Total	16,345,000

North Pacific Ocean (including Bering, Okhotsk, Japan, Yellow, Sulu, China, and Celebes Seas).

Area over 60° Fahr.	66,000
„ 50°–60° „	208,000
„ 40°–50° „	296,000
„ 35°–40° „	23,068,000
„ 30°–35° „	4,735,000
Total	28,373,000

SOUTH PACIFIC OCEAN (including Banda, Java, and Arafura Seas).

		Square miles.
Area over 60° Fahr.	...	35,000
„ 50°-60° „	...	142,000
„ 40°-50° „	...	591,000
„ 35°-40° „	...	19,992,000
„ 30°-35° „	...	3,100,000
	Total ...	23,860,000

SOUTHERN OCEAN.

Area 50°-60° Fahr.	...	11,000
„ 40°-50° „	...	101,000
„ 35°-40° „	...	1,660,000
„ 30°-35° „	...	24,155,000
„ under 30° „	...	427,000
	Total ...	26,354,000

ANTARCTIC OCEAN.

Area 35°-40° Fahr.	...	3,000
„ 30°-35° „	...	1,800,000
„ under 30° „	...	1,500,000
	Total ...	3,303,000

SUMMARY.

Area with bottom temperature over 60° Fahr.	...	270,000
„ „ „ 50°-60° „	...	1,501,000
„ „ „ 40°-50° „	...	2,652,000
„ „ „ 35°-40° „	...	66,893,000
„ „ „ 30°-35° „	...	54,325,000
„ „ „ under 30° „	...	2,397,000
	Total ...	128,038,000

The area of the ocean's floor beyond the 100-fathom line has been estimated, in round numbers, at 127,100,000 square miles; the foregoing figures may be stated as follows, with the corresponding percentages:—

			Square miles.	Percentage.
Area over 60° Fahr.	(over 15°·56 C.)	...	300,000 =	0·24
„ 50°-60° „	(10°·00-15°·56 C.)	...	1,500,000 =	1·18
„ 40°-50° „	(4°·44-10°·00 C.)	...	2,600,000 =	2·04
„ 35°-40° „	(1°·67-4°·44 C.)	...	66,000,000 =	51·93
„ 30°-35° „	(−1°·11-1°·67 C.)	...	54,300,000 =	42·72
„ under 30° „	(under −1°·11 C.)	...	2,400,000 =	1·89
	Total	...	127,100,000	100·00

B. *Temperature over the Floor of the Ocean in Depths less than* 100 *Fathoms.*

In order to form some idea of the distribution of temperature over the whole sea-floor, the probable extent of the areas covered by water at different temperatures between the shore and the 100-fathom line

has been estimated. With the aid of Dr. Buchan's maps,* showing the mean annual surface temperature and the temperature at the depth of 100 fathoms, the probable extent of the areas at the temperature-intervals of 10° Fahr. were estimated for small sections along the coast-lines all round the world, and the probable extent of the areas thus obtained were added together to complete each of the larger subdivisions of the ocean. The results obtained are as follows:—

North Atlantic (including Gulf of Mexico, Caribbean, Mediterranean, Black, North Baltic, and Norwegian Seas).

	Square miles.
Area over 80° Fahr.	70,000
„ 70°–80° „	208,000
„ 60°–70° „	709,000
„ 50°–60° „	399,000
„ 40°–50° „	580,000
„ 35°–40° „	222,000
„ 30°–35° „	27,000
„ under 30° „	50,000
Total	2,265,000

South Atlantic.

Area 70°–80° Fahr.	43,000
„ 60°–70° „	203,000
„ 50°–60° „	147,000
„ 40°–50° „	9,000
Total	402,000

Arctic Ocean.

Area 35°–40° Fahr.	30,000
„ 30°–35° „	1,150,000
„ under 30° „	15,000
Total	1,195,000

Indian Ocean (including Red Sea and Persian Gulf).

Area over 80° Fahr.	38,000
„ 70°–80° „	309,000
„ 60°–70° „	404,000
„ 50°–60° „	228,000
Total	979,000

North Pacific (including Bering, Okhotsk, Japan, Yellow, Sulu, China, and Celebes Seas).

Area over 80° Fahr.	93,000
„ 70°–80° „	559,000
„ 60°–70° „	437,000
„ 50°–60° „	208,000
„ 40°–50° „	144,000
„ 35°–40° „	689,000
„ 30°–35° „	158,000
Total	2,288,000

* See Maps 2 and 3 in "*Challenger* Report on Oceanic Circulation" (Phys. Chem. Chall. Exp., pt. viii.). Appendix to Summary of Results, 1895.

South Pacific (including Banda, Java, and Arafura Seas).

	Square miles.
Area over 80° Fahr.	94,000
„ 70°–80° „	549,000
„ 60°–70° „	349,000
„ 50°–60° „	86,000
„ 40°–50° „	8,000
Total	1,086,000

Southern Ocean.

Area 50°–60° Fahr.	148,000
„ 40°–50° „	125,000
„ 35°–40° „	123,000
„ 30°–35° „	128,000
„ under 30° „	280,000
Total	804,000

Antarctic Ocean.

Area under 30° Fahr.	1,100,000

Summary.

Area with bottom temperature over 80° Fahr.	295,000
„ „ „ 70°–80° „	1,668,000
„ „ „ 60°–70° „	2,102,000
„ „ „ 50°–60° „	1,216,000
„ „ „ 40°–50° „	866,000
„ „ „ 35°–40° „	1,064,000
„ „ „ 30°–35° „	1,463,000
„ „ „ under 30° „	1,445,000
Total	10,119,000

The area of the ocean's floor within the 100-fathom line has been estimated in round numbers at 10,100,000 square miles; the foregoing figures may be stated as follows, with the corresponding percentages:—

		Square miles.	Percentage.
Area over 80° Fahr.		290,000 =	2·87
„ 70°–80° „	(over 26°·67 C.)	1,670,000 =	16·54
„ 60°–70° „	(21°·11–26°·67 C.)	2,100,000 =	20·79
„ 50°–60° „	(15°·56–21°·11 C.)	1,210,000 =	11·98
„ 40°–50° „	(10°·00–15°·56 C.)	870,000 =	8·61
„ 35°–40° „	(4°·44–10°·00 C.)	1,060,000 =	10·49
„ 30°–35° „	(−1°·11–4°·44 C.)	1,460,000 =	14·46
„ under 30° „	(under −1°·11 C.)	1,440,000 =	14·26
Total		10,100,000	100·00

It will thus be seen that of the 10,100,000 square miles of the earth's surface covered by the ocean inside the 100-fathom line, 3,960,000 square miles, or 39 per cent., are overlaid by water with a temperature of less than 40° Fahr. (under 4°·44 C.), and that 6,140,000 square miles, or 61 per cent., are covered by water with a temperature above 40° Fahr. (over 4°·44 C.).

C. *Temperature over the Entire Floor of the Ocean.*

If we now combine the figures for the deep-sea region beyond the 100-fathom line with the figures for the shallow-water region within the 100-fathom line, we arrive at the following approximation of the distribution of temperature over the whole sea-floor :—

			Square miles.		Percentage.
Area over 60° Fahr.	(over 15°·56 C.)	... ...	4,360,000	=	3·18
" 50°–60° "	(10°·00–15°·56 C.)	... ...	2,710,000	=	1·97
" 40°–50° "	(4°·44–10°·00 C.)	... ...	3,470,000	=	2·53
" 35°–40° "	(1°·67–4°·44 C.)	... ...	67,060,000	=	48·88
" 30°–35° "	(–1°·11–1°·67 C.)	... ...	55,760,000	=	40·64
" under 30° "	(under –1°·11 C.)	... ...	3,810,000	=	2·80
	Total	... ...	137,200,000		100·00

It has already been stated that 96 per cent. of the ocean's floor beyond the 100-fathom line is covered by water with a temperature under 40° Fahr., and that 39 per cent. of the ocean's floor within the 100-fathom line is covered by water with a temperature under 40° Fahr. The above figures show that, of the entire sea-floor, 92 per cent. is overlaid by water having a temperature less than 40° Fahr. (under 4°·44 C.), while less than 8 per cent. is overlaid by water having a temperature higher than 40° Fahr. (over 4°·44 C.).

II. The Temperature of the Surface Waters of the Ocean.

So far as we are aware, no previous attempt has been made to prepare maps showing the absolute maximum and minimum temperature of the surface waters over the globe. Many years ago, Prof. Dana, in his 'Manual of Geology,' * published an isocrymal chart based upon the mean temperature of the coldest month of the year, which corresponds somewhat to the minimum map accompanying this paper, but the temperature shown on this map appears always, as might be expected, to be lower than that shown on Prof. Dana's, though comparison is not easy, because Prof. Dana drew his lines at different intervals from those adopted in the present case. The map published in this *Journal* for August last year, illustrating the annual range of temperature in the surface waters of the ocean, was prepared from all the available maximum and minimum temperature observations for the coldest and warmest months of the year in each 2° square over the water-surface of the globe, and we had thus at hand the requisite information for preparing the accompanying maps showing both the minimum and maximum surface temperature of the sea. They are interesting from many points of view, and will doubtless be useful to naturalists.

---

* Revised edition. Philadelphia : 1865.

A. *Minimum Temperature of the Surface Waters of the Sea (see Map 2).*

From the figures supplied to us by the Meteorological Office, the winter minimum (*i.e.* the minimum for February north of the equator, and the minimum for August south of the equator) in each 2° square throughout the great ocean basins was extracted, and the figures thus obtained were compared with observations from every other available source. In this way were laid down on blank maps the lowest recorded readings in every 2° square, and then the lines were drawn at intervals of 10° Fahr., as shown on the map accompanying this paper.

On this map shades of red are used to indicate a temperature exceeding 50° Fahr., and shades of blue to indicate a temperature under 50° Fahr., and it is interesting to observe that the dividing-line representing 50° Fahr. coincides approximately with the 40th parallels of latitude north and south.

The darkest shade of blue, indicating a temperature under 30° Fahr., covers the Arctic and Antarctic regions, lying in the Southern ocean entirely within the latitude of 50° S., and approximating in many places with the latitude of 60° S., while in the North-West Atlantic and North-West Pacific it reaches the latitude of 40° N. The second shade of blue, indicating a temperature of 30° to 40° Fahr., forms a band round the earth in the Southern ocean; in the North Pacific there is an area extending from the Yellow sea to the Alaskan coast and into the Bering sea; in the North Atlantic, a narrow band starts from the east coast of the United States, trending first eastwards and then northwards past the coasts of Iceland, spreading out towards the coasts of Spitsbergen and Norway, and onwards to the coast of Novaya Zemlya. The third shade of blue, indicating a temperature between 40° and 50° Fahr., also forms a band in the Southern ocean, broken only by the extension southwards of the South American continent; a band crosses the North Pacific from the Chinese to the North American coast, narrow in the western portion, but spreading out on approaching the American continent; a similar band crosses the North Atlantic, but its characteristic features are much more strongly pronounced than in the case of the North Pacific, commencing as a very narrow band off the east coast of the United States, and expanding enormously towards the shores of Europe. The palest shade of red, indicating a temperature between 50° and 60° Fahr., forms a band crossing the South Pacific from the west coast of South America, broken for a short distance on the south coast of Australia, thence uninterruptedly crossing the South Indian and South Atlantic oceans to the coast of South America; a band crosses the North Pacific, outside the tropics except for a short distance off the Chinese coast; and a similar band crosses the North Atlantic entirely outside the tropics, and nearly fills up the Mediterranean. The peculiar trend of this area off the west coast of South America, which is still more marked in the next area (60° to 70° Fahr.), is to be accounted for

by off-shore winds and consequent upwelling, as referred to in the paper on "Range of Surface Temperature." *

The second shade of red, indicating a temperature between 60° and 70° Fahr., is found in detached bands crossing the northern and southern parts of the great ocean basins, approximately in the latitudes of the tropics of Cancer and Capricorn respectively, separated by a great circumtropical band of the third shade of red, indicating a temperature between 70° and 80° Fahr. The darkest shade of red, indicating a temperature over 80° Fahr., is found in the equatorial regions of the Pacific and Indian oceans, extending across the East Indian Archipelago from long. 60° E. in the Indian ocean to long. 70° W. in the Pacific; there are also indications that in the Caribbean sea off Yucatan the minimum temperature does not fall below 80° Fahr.

The lines were transferred to equal-surface hemispheres, and the areas marked out were measured with the planimeter, with the following results:—

NORTH ATLANTIC (including Gulf of Mexico, Caribbean, Mediterranean, Black, North, Baltic, and Norwegian Seas).

	Square miles.
Area over 80° Fahr.	23,000
" 70°-80° "	6,546,000
" 60°-70° "	3,775,000
" 50°-60° "	2,712,000
" 40°-50° "	2,416,000
" 30°-40° "	1,329,000
" under 30° "	1,986,000
Total	18,787,000

SOUTH ATLANTIC.

Area 70°-80° Fahr.	2,981,000
" 60°-70° "	3,959,000
" 50°-60° "	2,633,000
" 40°-50° "	620,000
Total	10,193,000

ARCTIC OCEAN.

Area 30°-40° Fahr.	340,000
" under 30° "	4,441,000
Total	4,781,000

INDIAN OCEAN (including Red Sea and Persian Gulf).

Area over 80° Fahr.	1,432,000
" 70°-80° "	8,064,000
" 60°-70° "	3,691,000
" 50°-60° "	2,856,000
" 40°-50° "	1,278,000
Total	17,321,000

* *Geographical Journal*, vol. xii. p. 128, 1898.

NORTH PACIFIC (including Bering, Okhotsk, Japan, Yellow, China, Celebes, and Sulu Seas).

	Square miles.
Area over 80° Fahr.	3,939,000
„ 70°–80° „	13,530,000
„ 60°–70° „	3,949,000
„ 50°–60° „	2,803,000
„ 40°–50° „	1,739,000
„ 30°–40° „	3,983,000
„ under 30° „	816,000
Total	30,759,000

SOUTH PACIFIC (including Banda, Java, and Arafura Seas).

Area over 80° Fahr.	3,163,000
„ 70°–80° „	10,215,000
„ 60°–70° „	6,655,000
„ 50°–60° „	4,685,000
„ 40°–50° „	233,000
Total	24,951,000

SOUTHERN OCEAN.

Area 50°–60° Fahr.	872,000
„ 40°–50° „	8,905,000
„ 30°–40° „	8,247,000
„ under 30° „	8,130,000
Total	26,154,000

ANTARCTIC OCEAN.

Area under 30° Fahr.	4,433,000

SUMMARY.

Area with minimum surface temperature over 80° Fahr.	8,557,000
„ „ „ „ 70°–80° „	41,336,000
„ „ „ „ 60°–70° „	22,029,000
„ „ „ „ 50°–60° „	16,561,000
„ „ „ „ 40°–50° „	15,191,000
„ „ „ „ 30°–40° „	13,899,000
„ „ „ „ under 30° „	19,806,000
Total	137,379,000

Or, in round numbers, with percentages—

		Square miles.	Percentage.
Area over 80° Fahr.	(over 26°·67 C.)	8,500,000 =	6·20
„ 70°–80° „	(21°·11–26°·67 C.)	41,300,000 =	30·10
„ 60°–70° „	(15°·56–21°·11 C.)	22,000,000 =	16·03
„ 50°–60° „	(10°·00–15°·56 C.)	16,500,000 =	12·03
„ 40°–50° „	(4°·44–10°·00 C.)	15,200,000 =	11·08
„ 30°–40° „	(−1°·11–4°·44 C.)	13,900,000 =	10·13
„ under 30° „	(under −1°·11 C.)	19,800,000 =	14·43
Total		137,200,000	100·00

It appears, from the above figures, that the surface waters of the ocean where the temperature falls below 40° Fahr. (under 4°·44 C.) in the coldest

months of the year, cover an area of about 33,700,000 square miles, or about 25 per cent. of the water-surface of the globe, while the waters having a temperature of over 40° Fahr. (over 4·44° C.) in the coldest months of the year cover an area of about 103,500,000 square miles, or about 75 per cent.

B. *Maximum Temperature of the Surface Waters of the Sea* (*see Map* 3).

For the preparation of the map showing the maximum surface temperature a similar method was adopted; the summer maximum was laid down in each 2° square, and lines were drawn at intervals of 10° Fahr., in a similar manner to that described for the minimum map.

The colours on this map have the same signification as on the minimum map, but since temperatures under 30° Fahr. disappear from the map, only two shades of blue are used, the darker shade indicating a temperature under 40° Fahr., and the paler shade a temperature between 40° and 50° Fahr., both of which are found only far to the north and to the south. The dividing-line between the blue and red colours here approximates in the south with the latitude of about 50° S., and in the North Atlantic and North Pacific with the arctic circle, while, as already stated, in the minimum map this same dividing-line approximates in position with the latitude of about 40° both in the north and south. The striking feature of this maximum map is the great circumtropical belt having a temperature between 80° and 90° Fahr., with here and there—in the Pacific and in the Red sea and Persian gulf—localities where the temperature exceeds 90° Fahr. This belt is broadest towards the western part of each of the great oceans, narrowing towards the eastern boundaries. On the polar sides of this circumtropical belt bands in paler shades of red, indicating successively a temperature between 70° and 80° Fahr., 60° and 70° Fahr., and 50° and 60° Fahr., succeed each other towards the north and south.

On the lines being transferred to equal-surface hemispheres, the areas were measured by the planimeter, with the following results:—

North Atlantic (including Gulf of Mexico, Caribbean, Mediterranean, Black, North, Baltic, and Norwegian Seas).

	Square miles.
Area 80°–90° Fahr.	11,984,000
„ 70°–80° „	2,496,000
„ 60°–70° „	1,637,000
„ 50°–60° „	1,705,000
„ 40°–50° „	737,000
„ 30°–40° „	119,000
Total	18,678,000

South Atlantic.

	Square miles.
Area 80°–90° Fahr.	4,570,000
„ 70°–80° „	5,118,000
„ 60°–70° „	505,000
Total	10,193,000

ARCTIC OCEAN.

	Square miles.
Area 40°-50° Fahr.	1,280,000
„ 30°-40° „	3,500,000
Total	4,780,000

INDIAN OCEAN (including Red Sea and Persian Gulf).

Area over 90° Fahr.	393,000
„ 80°-90° „	11,742,000
„ 70°-80° „	4,104,000
„ 60°-70° „	1,084,000
Total	17,323,000

NORTH PACIFIC (including Bering, Okhotsk, Japan, Yellow, China, Celebes, and Sulu Seas).

Area over 90° Fahr.	54,000
„ 80°-90° „	19,835,000
„ 70°-80° „	5,678,000
„ 60°-70° „	2,702,000
„ 50°-60° „	2,375,000
„ 40°-50° „	39,000
Total	30,683,000

SOUTH PACIFIC (including Banda, Java, and Arafura Seas).

Area over 90° Fahr.	19,000
„ 80°-90° „	16,561,000
„ 70°-80° „	6,775,000
„ 60°-70° „	1,587,000
Total	24,942,000

SOUTHERN OCEAN.

Area 70°-80° Fahr.	543,000
„ 60°-70° „	4,223,000
„ 50°-60° „	7,248,000
„ 40°-50° „	4,882,000
„ 30°-40° „	9,228,000
Total	26,124,000

ANTARCTIC OCEAN.

Area 30°-40° Fahr.	4,433,000

SUMMARY.

Area with maximum surface temperature over 90° Fahr.	466,000
„ „ „ „ 80°-90° „	64,692,000
„ „ „ „ 70°-80° „	24,714,000
„ „ „ „ 60°-70° „	11,738,000
„ „ „ „ 50°-60° „	11,328,000
„ „ „ „ 40°-50° „	6,938,000
„ „ „ „ 30°-40° „	17,280,000
Total	137,156,000

Or, in round numbers, with the corresponding percentages—

			Square miles.	Percentage.
Area over 90° Fahr.	(over 32°·22 C.)	... ...	500,000 =	0·36
„ 80°–90° „	(26°·67 to 32°·22 C.)	... ...	64,700,000 =	47·16
„ 70°–80° „	(21°·11 „ 26°·67 C.)	... ...	24,700,000 =	18·00
„ 60°–70° „	(15°·56 „ 21°·11 C.)	... ...	11,700,000 =	8·53
„ 50°–60° „	(10°·00 „ 15°·56 C.)	... ...	11,300,000 =	8·24
„ 40°–50° „	(4°·44 „ 10°·00 C.)	... ...	7,000,000 =	5·10
„ 30°–40° „	(under 4°·44 C.)	... ...	17,300,000 =	12·61
	Total	... ...	137,200,000	100·00

The above figures show that the surface waters of the ocean having a maximum temperature under 40° Fahr. (under 4°·44 C.) cover an area of about 17,300,000 square miles, or about 13 per cent. of the water-surface of the globe; while the waters with a maximum temperature over 40° Fahr. (over 4°·44 C.) cover an area of about 119,900,000 square miles, or about 87 per cent.

C. *Mean Temperature of the Surface of the Sea.*

For the sake of comparison the lines on Dr. Buchan's map, showing the mean annual surface temperature of the ocean ('*Challenger* Report on Oceanic Circulation,' Map 2, 1895), were transferred to equal-surface hemispheres, and the areas marked out were measured with the planimeter. This map (which is based on the earlier map published by Lieut. Baillie, revised and brought up to date) was constructed from the mean of all recorded observations in 5° squares, and the lines were drawn through the mean of the positions in each of the squares. On Dr. Buchan's map the line of 30° Fahr. is shown only in the Norwegian sea, and the line of 40° Fahr. is omitted from the North Pacific, but these lines have been filled in approximately from theoretical considerations both in the far north and far south. The results arrived at are as follows:—

North Atlantic (including Gulf of Mexico, Caribbean, Mediterranean, Black, North, Baltic, and Norwegian Seas).

		Square miles.
Area over 80° Fahr.	... ...	4,819,000
„ 70°–80° „	... ...	5,923,000
„ 60°–70° „	... ...	2,868,000
„ 50°–60° „	... ...	1,793,000
„ 40°–50° „	... ...	1,882,000
„ 30°–40° „	... ...	1,229,000
„ under 30° „	... ...	194,000
	Total	18,708,000

South Atlantic.

Area 70°–80° Fahr.	... ...	5,730,000
„ 60°–70° „	... ...	3,446,000
„ 50°–60° „	... ...	1,007,000
	Total	10,183,000

Arctic Ocean.

	Square miles.
Area 30°–40° Fahr.	2,000,000
„ under 30° „	2,781,000
Total	4,781,000

Indian Ocean (including Red Sea and Persian Gulf).

Area over 80° Fahr.	7,969,000
„ 70°–80° „	4,928,000
„ 60°–70° „	3,369,000
„ 50°–60° „	1,046,000
Total	17,312,000

North Pacific (including Bering, Okhotsk, Japan, Yellow, China, Celebes, and Sulu Seas).

Area over 80° Fahr.	9,889,000
„ 70°–80° „	11,213,000
„ 60°–70° „	3,230,000
„ 50°–60° „	2,727,000
„ 40°–50° „	2,808,000
„ 30°–40° „	859,000
Total	30,726,000

South Pacific (including Banda, Java, and Arafura Seas).

Area over 80° Fahr.	7,425,000
„ 70°–80° „	10,452,000
„ 60°–70° „	5,884,000
„ 50°–60° „	1,161,000
Total	24,922,000

Southern Ocean.

Area 50°–60° Fahr.	5,656,000
„ 40°–50° „	10,180,000
„ 30°–40° „	10,337,000
Total	26,173,000

Antarctic Ocean.

Area under 30° Fahr.	4,433,000

Summary.

Area over 80° Fahr.	30,102,000
„ 70°–80° „	38,246,000
„ 60°–70° „	18,797,000
„ 50°–60° „	13,390,000
„ 40°–50° „	14,870,000
„ 30°–40° „	14,425,000
„ under 30° „	7,408,000
Total	137,238,000

Or, in round numbers, with the corresponding percentages—

			Square miles.	Percentage.
Area over 80° Fahr.	(over 26°·67 C.)	... ...	30,100,000	= 21·94
„ 70°–80° „	(21°·11 to 26°·67 C.) ...	... ...	38,200,000	= 27·84
„ 60°–70° „	(15°·56 „ 21°·11 „) ...	... ...	18,800,000	= 13·70
„ 50°–60° „	(10°·00 „ 15°·56 „) ...	... ...	13,400,000	= 9·77
„ 40°–50° „	(4°·44 „ 10°·00 „) ...	... ...	14,900,000	= 10·86
„ 30°–40° „	(−1°·11 „ 4°·44 „) ...	... ...	14,400,000	= 10·50
„ under 30° „	(under −1°·11 „) ...	... ...	7,400,000	= 5·39
	Total	... ...	137,200,000	100·00

The above figures show that the surface waters of the ocean having a mean temperature under 40° Fahr. (under 4°·44 C.) covers an area of about 21,800,000 square miles, or about 16 per cent. of the water surface of the globe; while the waters with a mean temperature over 40° Fahr. (over 4°·44 C.) cover an area of about 115,400,000 square miles, or about 84 per cent.

It is very interesting to compare the figures arrived at from the measurement of the areas as laid down on this map of mean annual surface temperature, with the figures obtained by taking a mean of the two numbers representing the measurements of the areas of different bands of temperature as laid down on the maps of minimum and maximum surface temperature, for they should be comparable, though the result of such diverse methods. The figures obtained for each interval of 10° Fahr. by these two methods are shown in the following table:—

	Areas of mean annual surface temperature.	Mean deduced from the minimum and maximum surface temperature.
	Sq. miles.	Sq. miles.
Area over 90° Fahr.	—	200,000
„ 80°–90° „	30,100,000	36,600,000
„ 70°–80° „	38,200,000	33,000,000
„ 60°–70° „	18,800,000	16,900,000
„ 50°–60° „	13,400,000	13,900,000
„ 40°–50° „	14,900,000	11,100,000
„ 30°–40° „	14,400,000	15,600,000
„ under 30° „	7,400,000	9,900,000
Total	137,200,000	137,200,000

General Remarks.

All the figures given in the foregoing pages, as well as an examination of the three maps accompanying this paper, bring out the striking contrast between the temperature conditions on the surface and on the bottom of the ocean. Of the entire sea-floor 92 per cent. is overlaid by water having a temperature under 40° Fahr. (under 4°·44 C.), while of the entire surface of the ocean only about 16 per cent. has a mean temperature under 40° Fahr. (under 4°·44 C.).

From the data available a preliminary attempt was made at a rough

estimation of the proportion of the entire bulk of water in the ocean with a temperature below 40° Fahr.; the result arrived at is that probably more than 80 per cent. of the whole mass of ocean water has a temperature under 40° Fahr., while less than 20 per cent. has a temperature exceeding 40° Fahr.

The maps and tables also suggest some relations of much interest to the biologist and the geologist. Wherever the waters of the ocean have a temperature exceeding 60° Fahr., a more abundant secretion of carbonate of lime by marine organisms takes place than in areas where lower temperatures prevail. The massive coral-reefs are all situated along shores where these high temperatures prevail, and are made up of the shells and skeletons of organisms which, when alive, are attached to or creep over the bottom, and are now called benthonic organisms. The remains of pelagic or planktonic organisms make up an extremely small part of a true coral reef. From the foregoing investigation, it appears that an area of only about 4,000,000 square miles, or 3 per cent. of the floor of the ocean, presents conditions of temperature favourable for the vigorous growth of coral reefs and of those organisms which require a temperature of 60° Fahr. all the year round.

On the other hand, more than half of the surface of the ocean has a temperature which never falls below 60° Fahr. at any time of the year, and in these surface waters of high temperature there is an abundant secretion of carbonate of lime by pelagic molluscs, pelagic foraminifera, coccospheres, and rhabdospheres, and of silica by radiolaria and diatoms. The dead shells and skeletons of these surface or planktonic organisms fall to the bottom of the ocean, and make up the major part of the deep-sea deposits known as pteropod, globigerina, and radiolarian oozes, as well as a very considerable part of the red-clay and blue-mud deposits in deep water. But the temperature at the bottom where these deposits are being laid down is, as we have seen, very low, so that there are mingled in the same marine deposits now forming over a large part of the earth's surface the remains of animals that lived during their whole life in a temperature between 70° and 90° Fahr., and the remains of animals that lived during their whole life at a temperature of 1°, 2°, or 3° Fahr. above the freezing-point of fresh water. The bearing of this on a study of the conditions under which many fossiliferous marine rocks have been laid down is evident.

THE SWEDISH ARCTIC EXPEDITION OF 1898.*

By Prof. A. G. NATHORST.

It is more than forty years ago, viz. in 1858, that the first Swedish expedition, under O. Torell, visited Spitsbergen. To this their first

* Translated by J. T. Bealby, B.A. Map, p. 128.

love the Swedes have stuck with peculiar fidelity, for of some twenty arctic expeditions in all which, during that time, have left the shores of Sweden, no less than thirteen have had for their object the exploration of the islands of Spitsbergen. Through their instrumentality, the western and north-western parts of the archipelago had become tolerably well known, though probably this result would not have been achieved so easily had it not been for the Gulf Stream, which washes the western shores. Indeed, the western coasts are now relatively so easy of access that not only do companies of tourists visit them every summer, but at Advent bay in Ice fjord, on West Spitsbergen, a little hotel has been built for their accommodation.

The eastern shores, on the other hand, are more inaccessible, owing to the packing of the polar ice, carried thither by the cold stream which sweeps down upon them from the east.

Of the various Swedish expeditions which, previous to the year 1898, had sailed for Spitsbergen, only one, namely, that of Baron Nordenskjöld in 1864, entered Storfjord, on the east side of West Spitsbergen, and none had penetrated to the waters east of the whole group. Owing to these circumstances, the obligation to complete the exploration of the archipelago seemed to devolve naturally, and as of peculiar right, upon the Swedes, and we regarded it as especially incumbent upon us to investigate and map King Charles Land. This island, or rather group of islands, was observed in 1864 by Nordenskjöld and Dunér from the summit of White mountain, in Spitsbergen, and accordingly they entered it upon the map which they published in the following year. It is true it had, like so many other islands in those regions, been previously known to the Norwegian whalers and sealers; but Norden skjöld and Dunér were the first to introduce it to the notice of geographers.

But King Charles Land was not the only island which lay to the east of Spitsbergen, and claimed the attention of Swedish explorers and scientists. There was also the land called White island, which Captain Kjeldsen saw in 1876, and which E. Johannesen re-discovered in 1887. The latter, however, gave it a new name, namely, New Iceland. It is now beyond doubt that this island is identical with the land which was observed as long ago as 1707 by Commander Giles, and called after him Giles (or Gillis) Land.

The exploration of these two insular regions was the chief object of the Swedish expedition of 1898. But as, in all probability, it would not be possible to approach them until the latter part of the summer, it was deemed advisable to devote the earlier weeks of the voyage to the Spitsbergen group, as well as to a stay at Bear (Beeren) island on the way. Our first object, therefore, was to reach the southern part of Spitsbergen in the beginning of June, and make a reconnaissance of the ice. At that early period of the summer the ice would, in all likelihood,

prevent further advance to the eastward. But later on it would no doubt be more accessible, and it would be possible to penetrate as far as King Charles Land and the region to the east of North-East Land, where possibly there exist other islands besides Giles Land forming the link between Spitsbergen and Franz Josef Land.

It may be doubted whether, wealth and population being duly taken into account, there is any country which displays, relatively, as great an amount of private generosity in furthering scientific objects as does Sweden. In the case of our expedition, King Oscar once more set the example; and very soon, through the kindness and liberality of friends of geographical exploration, the necessary means were raised, and the expedition equipped.

In Tönsberg I bought the steam-whaler *Antarctic*, and had her repaired and refitted. She was built at Drammen, in Norway, and, under the name of the *Cap Nor* (*Cape North*), had been employed in the seal fishery off Jan Mayen island. Subsequently she was bought by Svend Foyn, and re-christened the *Antarctic*, and despatched to the Southern seas in quest of whales. The whale-fishing was not a success, although the vessel penetrated to South Victoria Land and the latitude of 74° 10′ S. Nevertheless, the voyage was not fruitless, for on the island of Kerguelen, on the way out, the *Antarctic* made a valuable capture of elephant seals. It may be interesting to mention that one of those who made this voyage was Mr. Borchgrevink, the Norwegian, who is now leading an expedition to the ice of the south pole. Having bought my ship, I had her enrolled on the list of the Royal Swedish Yacht Club, and thus had the proud pleasure of being the first to carry the Society's tridentine flag into those seldom-visited waters of the Far North. The *Antarctic* is a strong and handsome arctic vessel, a little smaller than the famous *Vega*, provided with a double outer planking, and, besides, an "ice-skin" or a third sheathing of greenheart, and with her bow strengthened outside by iron bands. She is very high rigged, sails well, and behaves excellently in a heavy sea.

On her deck I had a deck-house constructed, so as to afford not only a cabin for the captain, but also a laboratory for the scientific staff. The latter was, of course, very small; nevertheless, it proved most useful. In it the doctor's bacteriological apparatus was installed, and there, too, the zoologists and botanists of the expedition carried out their several labours. The official who was charged with the preservation of the vertebrates had a special cabin below deck, and close beside it was a dark room for developing photographic plates, provided with all the necessary chemicals, and so forth.

Mr. Gunnar Larsson, a merchant of Norrköping, made us a present of a cage of carrier pigeons, which we intended to employ in maintaining communication between the vessel and any boat parties that might be sent out. The cage had its place on the roof of the deck-house; and

the birds throve and laid their eggs, and brought off their broods. We had no occasion to make use of them for the conveyance of messages; but the trials we instituted with them answered admirably, for when we took them on shore with us, both at King Charles Land and Spitsbergen, the instant they were released they made direct for the vessel.

In the foremost part of the deck we had, on the port side, a roll of pliable wire rope, the thickness of a man's little finger, some 6600 yards long, a present from the Fagersta factory; and on the starboard side, a thin sounding-line of Italian hemp, 6000 yards long. The wire rope was used for bringing up the zoological trawls and dredges; the hemp rope for soundings and collecting specimens of the sea-water. Moreover, we had a large mechanical sieve, of the pattern used by the Danish Ingolf expedition, for sifting the dredgings we brought up from the bottom of the sea, and separating out the zoological specimens. The Royal Zoological Museum of Stockholm presented us with our trawls and dredges; and for the collection of plankton we had tow-nets of different models.

For commander of the *Antarctic* I had the good fortune to secure Captain Emil Nilsson, of the Swedish Lloyd, a navigator of considerable experience in the arctic seas. He had made numerous voyages to the Yenisei, one of them with *Fraser* in 1878. Then in 1883 he was chosen by Nordenskjöld to command the *Sophia* in the Swedish Greenland expedition of that year.

Including myself, the leader of the expedition, we had nine scientists on board. To Mr. G. Kolthoff (conservator) was deputed the study of the higher animals. I myself took charge of the geology, being assisted, to some extent, by Dr. A. Hamberg (university docent), who also superintended the hydrographical and photogrammetrical labours. Our cartographer was Lieut. O. Kjellström. We four were old comrades, having all taken part in the Greenland expedition of 1883. Dr. A. Ohlin, who superintended the zoological dredgings, had also visited the Greenland seas, partly in the neighbourhood of Jan Mayen, partly in Baffin's bay, when search was made for Björling and Kallstenius. He also took part in the Swedish expedition to Tierra del Fuego. The other four members of the scientific staff were making their maiden voyage in arctic regions. They were Dr. E. Levin (university docent), doctor and bacteriologist; Messrs. Dr. G. Andersson (docent) and H. Hesselman (university graduate), botanists; and Mr. J. G. Andersson, assistant geologist and hydrographer. The crew consisted of eighteen men, so that in all we numbered twenty-eight persons. The second mate and three of the men, old whalers, were Norwegians. The first-mentioned had made twenty-three voyages to Jan Mayen; this was, therefore, his twenty-fourth visit to the arctic waters.

Bear Island.

We set sail from Gothenburg on May 25, and reached Tromsö on June 4. On the way up, I stayed a day at Andö island, one of the Lofoten group, for the purpose of studying the Jurassic coal-formations of Andesnes. Leaving Tromsö again on the afternoon of June 8, we

FIG. 1.—BEAR ISLAND.
(Reduced from the original map.)

directed our course for Bear (Beeren) island, taking hydrographical and zoological soundings on the way. Early on the 13th we made Bear island (Fig. 1), and anchored in Sydhamnen (Southern harbour).

Although Bear island lies relatively near to Norway, comparatively very little was hitherto known about it; for one thing, it had never

been properly mapped. This must, no doubt, be attributed to the absence of good harbours, as also to the prevalence of dense mists and the masses of drift-ice which are wont to beset the island, even to a late period of the summer. In 1882, when in about the same month I endeavoured to make the island, I was not able to get within sight of it, so broad were the fields of pack-ice which surrounded it. But in June, 1898, the island was absolutely free from ice; there was not a glimpse to be seen even from the summit of its highest elevation.

The coasts of Bear island exhibit all round striking evidence of the destructive power of the sea, and consequently present very fantastic outlines. On the south, where they rise to an altitude of 1300 feet,

FIG. 2.—BEAR ISLAND, SOUTHERN EXTREMITY WITH THE STAPPEN, SEEN FROM THE WEST.
(*From a photograph by A. Hamberg.*)

they plunge precipitously into the ocean, and are fenced about by sharp-pointed, isolated sea-cliffs, like, *e.g.*, the Stappen (Fig. 2), at the end of the southern promontory, which is pierced near the sea-level so that you can see right through it. On the west side there is a narrow pillar or column called the Needle or Awl (Syl), the appearance of which abundantly justifies its name. Of the remaining sea-cliffs scattered round about this island, I will only mention one more, the Burgomaster Gate (Fig. 3), so called from the enormous quantities of burgomaster gulls which breed upon it. This rock too is pierced, so that it is possible to row through the opening in a boat.

The eastern side of Bear island is dominated by Mount Misery, a table-mountain with three pyramidal peaks on the plateau, the Three Crowns, the highest of which attains an altitude of 1760 feet. On the north and north-west the island is low, not more than 120 to 160 feet

above sea-level; but even there the coasts are, for the most part, steep and only at few places accessible. All this northern portion of the island is the most desolate region it is possible to conceive—nothing but a wilderness of barren stones, almost extremely unrelieved by vegetation. As a matter of fact, vegetation is entirely scanty all over the island; what there is is confined to a few solitary oases of yellow *Ranunculaceæ*, red and white saxifrages, white mouse-eared chickweed (*Cerastia*), species of yellow and white *Drabæ*, some grasses, and a few other species. The Norwegian geologist Keilhau describes the island as "a skeleton of the Earth stripped absolutely naked," and it is a very true and accurate description.

FIG. 3.—THE BURGOMASTER GATE, BEAR ISLAND.
(*From a photograph by A. Hamberg.*)

But though the vegetation is scanty and the interior a barren stony waste, the coasts make ample amends; they teem with bird-life. To the south of the little bay in which we cast anchor there is a cliff, the Bird Mount (Fågelfjell), which rises perpendicularly from the sea. This literally swarmed with auks, kittiwakes, and fulmars; there were hundreds of thousands, nay, millions of them. Every ledge, every projection of the upper coast-cliffs was thick with birds, engaged in the important duties of incubation. Upon firing a shot, they rose into the air and hovered about the cliffs like a dense shower of snow; and yet there seemed to be quite as many left behind on the rocks.

Mr. Kolthoff's sharp eyes distinguished amongst them the razor-bill (*Alca torda*), a species which was not hitherto known to frequent the island. That tyrant of the northern sea-birds, the burgomaster gull, had also its regular nesting-places there, favouring especially the small sea-cliffs and "stacks" scattered around the coasts.

We spent a week at Bear island, a week of strenuous toil, for it was uncertain how soon the wind might change and render our anchorage unsafe. Lieut. Kjellström and his men walked all round the northern part of the island, and surveyed it for the purposes of a map. On his return he completed the survey of the southern half, which had in the mean time been partly mapped by Hamberg. The map (of which Fig. 1 is a reduced copy) which was drawn out on the basis of these observations, on the scale of 1 : 50,000, proved that the island is appreciably smaller than represented on most previous maps, as also that its form is different. In the northern part of the island there were a countless number of small lakes; but as in all probability these mostly dry up later on in the summer, they were not entered on our map, especially as to have entered them accurately would have demanded two or three weeks' labour. Lake Ella, however, newly discovered in the south-west, possesses a different character. It is a deep mountain lake with clear water, its surface lying 69 feet above the level of the sea, whilst its bottom lies 30 feet below that level. One of the men found some old pieces of oars beside the lake. They had apparently lain there a very long time, and would seem to indicate that some of the Norwegian or Russian seal-hunters, who have spent the winter on the island, had boats on the lake.

The geological results were not less important than the geographical. We already know that there were fossiliferous strata of the Permo-Carboniferous Age on Mount Misery, as also that in a few other places there was a species of coal-bearing sandstone with plant remains, this rock belonging to the transitional period between the Devonian and the Carboniferous systems. Besides these, certain Primary deposits were known to occur in the southern part of the island. The precise age of these last had not, however, been ascertained; but we discovered in them Orthoceratites and other fossils, on the strength of which Prof. G. Lindström assigns them to the Lower Silurian. We also discovered an extensive series of marine rocks, these too fossiliferous, and belonging to the Lower Carboniferous. Moreover, we ascertained that the three pyramidal summits of Mount Misery, the Three Crowns, belong to the Triassic formation. Thus we were able to establish the occurrence on Bear island of three geological systems which were not previously known to exist there.

Geologically, the history of the little island is thus very interesting. At the present time there are no glaciers to be found on it, and we did not know with certainty what its history had been during the Great Ice Age. When in 1870 I made my first voyage to the arctic regions, I spent a few hours on this island, and thought I was able to detect the presence of glacial striæ on the east coast, north of Mount Misery. But as at that time I was under twenty years of age, and had not had much geological experience, I often wondered since if my observation

had been correct. On the present occasion I not only had the good fortune to find the place again, and satisfy myself that my observation had been perfectly correct, but I also discovered glacial striæ in various other localities, and thus was able to satisfy myself that during the Glacial epoch Bear island was completely covered with "inland" ice. Yet, strange to say, the glacial centre was not on the higher parts of the island, but on the lower level west of Mount Misery. This, however, presupposes an almost incredible precipitation of snow on that portion of the island.

Bear island is tolerably rich in varieties of mineral; it was even alleged that traces of silver had been found. The most valuable mineral, however, is, or rather will be, the coal-seams in the northern part of the island. If these deposits are to be exploited—and that is merely a question of time—it will, I have little doubt, be found expedient to sink a shaft on the low northern part of the island, and connect the mine with the coast by means of a tramway. The execution of this plan will depend principally upon whether it is possible, by building a breakwater across the northern harbour (Nordhamnen), to make it sufficiently safe for vessels to load there. One difficulty would, at any rate, have to be reckoned with: in some years access to the island would be entirely prevented for several weeks in the early part of the summer by the drift-ice.

Round about Spitsbergen.

On June 20 we steamed away from Bear island, all the members of the scientific staff being hard at work recording the results of their respective labours. We had made good botanical and zoological acquisitions, and during the whole time of our stay the doctor's bacteriological apparatus was never idle. We had not got far from the island before it was withdrawn from our gaze by the dense mist in which it is almost constantly enveloped.

We next directed our course towards Hope island, of which we obtained our first glimpse on June 22. It had been my intention to examine and map this island, but my purpose was frustrated by the extraordinarily heavy swell. Besides that, landing is at all times difficult by reason of the steep shores and the shallow water which washes them. This island (see Fig. 4) is a very narrow ridge running north and south, built up of horizontal strata, which belong, probably, to the Jurassic system. It was destitute of the slightest pretence of a harbour.

Hope island was equally as free from ice as Bear island; but the outlook man in the "crow-nest" reported the appearance of ice to the north-east. Accordingly we steamed in that direction, that we might ascertain its character. At 4 o'clock on the morning of June 23 I was awakened by a sharp bumping, which shook the vessel from stem to

stern, followed by a scraping sound, and this was repeated several times. I knew perfectly well what these sounds meant—we were in the pack-ice; and I hurried up on deck. It was a splendid morning, the sky flooded with bright sunshine, and the ship surrounded on all sides by sheets of ice of all sizes, glittering white on the upper surface, but blue or greenish on the edges—a beautiful sight—we were just breaking through the thicker ice (77° 25′ N. lat., 27° 30′ E. long.); beyond it the pack was somewhat thinner. We continued to plough our way onwards for a while; but soon the ice began to get thicker and thicker, and shortly afterwards we came to the edge of the solid pack-ice, the "firm ice" as the whalers and sealers call it, which successfully defied all our efforts to force a passage through it. By this time we had

FIG. 4.—EAST SIDE OF HOPE ISLAND.
(*From a photograph by A. Hamberg.*)

reached 77° 30′ N. lat., 28° E. long. The lookout man was unable to perceive any opening towards either the north, the north-east, or the east, and the vivid ice-blink—the bright reflection of the sky immediately over solid ice—told plainly that it would be impossible to penetrate further in that direction. This was, indeed, precisely what I had anticipated. At all events, I was satisfied with what I saw. The ice was not thick, and in the course of a few weeks we should, no doubt, be able to force our way through it without much difficulty. And my regret at having to turn back was the less that at this season King Charles Land was certain to be deeply sheeted with snow, so that our botanical as well as geological labours would have yielded far fewer results than they did when we returned later on in the summer.

This was on the day before midsummer, a day which fully justified its name, for the thermometer registered 46°·6 Fahr. (7° C.) in the shade, and 69°·8 Fahr. (21° C.) in the sun. We accordingly turned back, and, doubling the southern end of Edge Land, made for the west side of

Storfjord. There we landed (Fig. 6) on June 25, and reaped a good geological harvest, notwithstanding that the ice and snow hampered us considerably; and, indeed, rendered it inexpedient to continue the work. We therefore steamed round South cape, and steered northwards towards Bell sound. On the 27th we cast anchor in Recherche bay, and there we stayed close upon three weeks.

As, according to the plan of our expedition, we had some time to spend in West Spitsbergen, it seemed to me that we could not employ

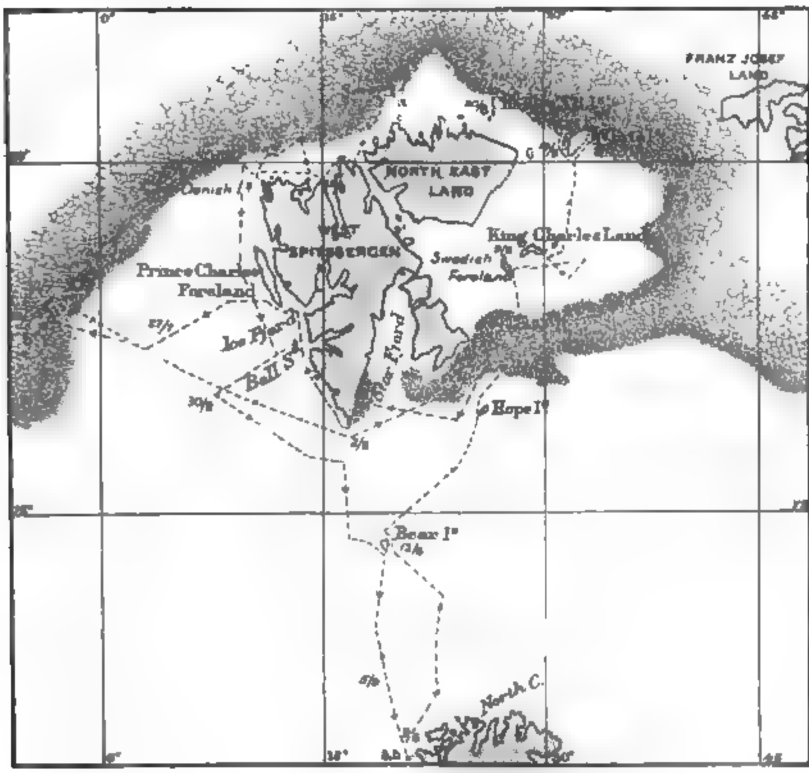


FIG. 5.—SKETCH OF THE COURSE OF THE *ANTARCTIC* IN 1898.

it to better advantage than in mapping that fjord—the largest but one on the west side of Spitsbergen—as well as by making a thorough examination of it, geologically, botanically, and in other ways. And there was also another advantage gained. The anchorage in Recherche bay is so good, that we were able to put out our furnaces, and so save three weeks' coal—a circumstance we were thankful for later on in the summer when we went east again.

Lieut. Kjellström laid down, by the usual cartographical method,

on the scale of 1 : 100,000, the northern arm of the fjord, Van Mijen bay, which proved to be nearly twice as long as shown on previous maps. At the same time, Hamberg, using the photogrammetric camera, charted the other arm, Van Keulen bay. Simultaneously with this, the geologists, zoologists, and botanists thoroughly explored the same two fjords; and during the whole of our stay, the doctor's bacteriological apparatus was incessantly at work. This is not the place to dwell upon the interesting geological results obtained. I must confine myself to stating that we discovered the presence of the same fossil Rhætian flora, which exists in Scoresby fjord on the east coast of Greenland; and proved that the Tertiary strata so rich in leaf-impressions, which I discovered in Ice fjord in 1882, were also extensively represented in the

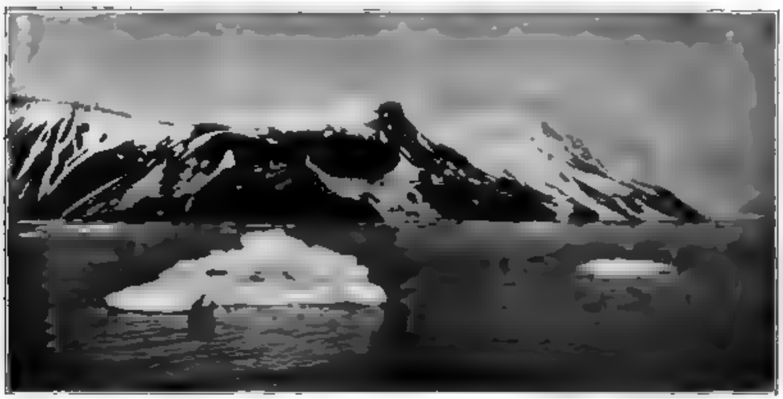


FIG. 6.—PART OF THE WESTERN SHORE OF THE STORFJORD.
(*From a photograph by O. Kjellström.*)

branches of Bell sound. In the places where these strata occur, you literally walk in fossils up to the knees, amongst them being magnificent specimens of leaf-impressions of marsh cypresses, alders, limes, magnolias, and other trees. A very noticeable feature about these leaf-impressions is that they are of an extraordinarily large size. It was a veritable El Dorado for the geologist; and yet it vexed us with the tortures of Tantalus, seeing that we had to leave behind us so much that we desired to take away.

Whilst staying in Recherche bay we had opportunities for hunting reindeer. On previous occasions when I had hunted reindeer in these high arctic regions, I had invariably found the animals exceedingly shy, from having been hunted before. But on this occasion we reached the interior of Van Mijen bay so soon after the departure of the ice, that the reindeer had not that season been disturbed by hunters. Thinking that the animals were as shy as usual, we approached them with the

utmost degree of caution, crawling upon our hands and knees, dragging ourselves forward on our stomachs, and keeping carefully out of the wind. But in the course of a few days we learned that we had only to show ourselves openly, and the natural curiosity of the animals would bring them within range of their own accord. After that we lost all pleasure in hunting them. On one occasion three reindeer approached within ten paces of the spot where I stood, whilst two big bucks with antlers remained gazing only a little further off. Although I had my rifle on my shoulder, I, of course, refrained from shooting. And I am pleased to be able to add that the other sportsmen of the expedition were of the same opinion as myself. We only shot, therefore, just as many as we wanted, although it would have been easy to have multiplied our game-lists. The poor creatures suffered enough as it was; for I afterwards heard most disgraceful stories of the barbarous way in which tourists shot every reindeer they could get within range of, and left the bodies to lie and rot where they fell.

On July 16 we left Bel sound and put in at Ice fjord, and on the following day cast anchor in Advent bay. At the post-office in the tourist hotel we received our first batch of letters since leaving Tromsö, and on the following mail-day, the 22nd, our last letters during the voyage. We stayed some days in Ice fjord, and, visiting various points in the locality, made more than one discovery of importance. Of these, however, I will only mention that we found the first Coleoptera yet noticed in Spitsbergen. These creatures had been diligently sought for by scientists, but none had hitherto been discovered, although whilst working in Klaas Billen bay in 1882, I fancied I observed a little staphylinid underneath a stone. But the creature escaped me, and in spite of diligent searching, I failed to find any more. In Coles bay we now discovered not only the same species as I thought I had observed before, but also a curculionid, living under the dwarf birchs, so that Spitsbergen really possesses at least two species of Coleoptera.* The presence of the curculionid is a fact of considerable importance in the history of zoological distribution. Although the same species occurs in Lapland and the western portion of Finmark, it is not found in eastern Finmark, nor yet in Iceland or Greenland, whilst the staphylinid does occur in each of these last.

From Coles bay we went to Safe haven (Fig. 7), and thence further to the west.

It had been part of my original plan to map the Storfjord. But after the Swedish Government resolved to send out an expedition for the purpose of measuring an arc of meridian at Spitsbergen, I decided

* According to Prof. Aurivillius, the staphylinid belongs to the genus *Homalota*, and is very probably *H. islandica* (Kraatz), whilst the curculionid is *Orchestes saliceti* (Fabr.).

to abandon that portion of my scheme. The Russian and Swedish scientists who will be sent to carry out this object will no doubt have ample opportunity to map the Storfjord. In place of that, I resolved to turn my attention to the Swedish deep, on the edge of the Greenland ice, and there make fresh soundings — an object which Prof. Pettersson had so much at heart in the interests of the hydrography of the Arctic ocean. The Swedish Arctic expedition of the *Sophia* in 1868 believed they had reached a depth of 2650 fathoms, and it was for the special purpose of testing this measurement that we carried with us such a long sounding-line and wire rope.

In consequence of this, on July 24 we left Ice fjord for the west, but before getting clear of the fjord we discovered that at its entrance the warm water of the Gulf Stream predominated to the bottom at a depth

FIG. 7.—AUK HORN IN SAFE HAVEN.
(*From a photograph by O. Kjellström.*)

of 220 fathoms. In 1890, when Gustaf Nordenskjöld sounded in the same place, he found that the Gulf Stream was simply a superficial current, flowing over a vaster volume of colder water. Consequently, the relations had materially altered in the interval. At the present time the Gulf Stream seems to flow in an exceptionally wide and deep current, and this sufficiently explains the unusual favourable conditions of the ice during recent years. After a short visit to the west shore of Prince Charles foreland, we steered for the west, and very soon reached a depth of 1475 fathoms. This figure remained pretty constant in subsequent soundings, for the greatest depth we recorded was only 1720 fathoms. In the Swedish deep the sounding-line touched the bottom at 1475 fathoms, or over 1000 fathoms less than had been previously supposed. There can be little doubt that this discrepancy is to be explained as due to the imperfect methods of sounding employed thirty years ago. As a matter

of fact, it is more difficult than would be believed to know with certainty when you do touch the bottom at such great depths. The lead we employed weighed 77 lbs. avoir., and when it was sent to the bottom its weight was further augmented by two sinkers, each weighing 110 lbs. avoir. But notwithstanding this, it was by no means easy to tell when it touched the bottom, for the line still continued to run out in consequence of its own intrinsic weight. As a check upon it, we had recourse to the watch. Every 100-metre length was marked with a piece of cloth. We timed by the watch the time it took for each successive length to cross the gunwale. As soon as the lead really rested on the bottom, the rope paid out more slowly, though without the watch to check it, it was impossible to tell this. The soundings were all taken by Mr. Hamberg, and he was never once mistaken as to when the lead really reached its goal. With each sounding we also brought up specimens of the sea-water, both from the bottom and from higher levels; thus our soundings took a good deal of time. An even greater amount of time was consumed by the trawl, which was let down on the other side of the vessel as soon as the soundings were completed, for in this case we were obliged to let out 5250 yards, or nearly 3 miles, of wire rope. And great was the expectation when the trawl came to the surface with its varied assortment of denizens of the great deep.

Our last soundings were taken at the edge of the Greenland ice, which, as in 1868, formed a gulf running westwards. As this ice, which drifts southwards along the east side of Greenland, is the same ice which carried Nansen's *Fram* across the polar ocean, I had specimens of the diatoms gathered which were found in the pools on its surface, as well as of the clayey mud which stuck to some of its ice-cakes. It is interesting to state that, according to the examination made by Prof. Cleve, the diatoms completely agree with the species which led Nansen to infer that the original starting-point of this drift-ice is to be found off the north of Siberia.

We left the Greenland ice on July 30, a beautiful sunny day, as fine as June 23 had been. We should have liked to stay there longer, but it was full time we were making a move for King Charles Land.

The journey back round the southern end of Spitsbergen presented no difficulties for so stout a polar voyager as the *Antarctic*. We passed South cape on August 2. During the following night, whilst crossing the entrance of the Storfjord, we encountered some ice, and again on the morning of the 3rd, off the south-east of Edge Land. On the afternoon of the same day we drove into the ice in earnest. Fortunately it was, on the whole, pretty evenly distributed, and presented no real difficulty to the *Antarctic*, though to a vessel less strongly constructed it would probably have proved an insuperable obstacle. All the rest of that day, and right on until one o'clock on the morning of August 4, we ploughed our way through the ice, and finally emerged into open

water. We now began to keep an eager look-out for King Charles Land. The first land we got sight of was King Charles island, which lies to the east; then about an hour later we perceived Swedish foreland, and finally, far away to the east, Mount Johnsen. But we were still a long way off, and it was two o'clock in the afternoon when we cast anchor on the south side of Swedish foreland. It was with a strange interest that I gazed upon this portion of mother Earth, which for a period of no less than twenty-eight years had hovered before my imagination, and which I had worked so hard to reach. I had thought—nay, to speak frankly, I had hoped—we should have a hard struggle to get through the ice, and was a little disappointed that our experience was limited to the slight skirmish we had. But, at any rate, here we were at the long-wished-for goal.

The following days were days of strenuous toil, like the period of our stay on Bear island; for here too our anchorage was insecure, and it was very uncertain how long we should be permitted to remain. Consequently we were obliged to make the best use of our time, and for three days we worked very hard. On the morning of the fourth day there was such a heavy swell, that communication between ship and shore was entirely suspended. In the afternoon, however, the swell abated a little, so that Lieut. Kjellström, who had returned from his surveying trip round the island, was fortunately able to come on board. On the following day we moved to the south-west extremity of the island, where we had some work to finish, and in the afternoon turned eastwards towards King Charles island, and anchored on the east side of a basalt promontory, Cape Altmann.

King Charles Land.

As already said, King Charles Land was first made known to geographers by Nordenskjöld and Dunér, who first saw it from the summit of White mount on Spitsbergen on August 22, 1864. "The view we obtained," they write, "was the most impressive to be found in Spitsbergen. At the distance of some 80 nautical miles to the east we saw a high land crowned by two rounded summits, which towered up conspicuously above the neighbouring peaks. It was the western projection of a vast arctic continent, as yet almost unknown; a land which, although discovered by Commander Giles as long ago as 1707, had in the interval been entirely forgotten, so that there was no trace of it to be seen on any of the existing maps. All the space between that continent and Spitsbergen was covered with one vast unbroken sea of ice, through which no vessel could possibly force a passage. For this reason we were reluctantly compelled to abandon our desire to visit that unknown land." *

* 'Svenska Expeditionen till Spetsbergen år 1864,' p. 130. Stockholm. 1867.

The accompanying illustration (Fig. 8) is a facsimile of a sketch reproduced on p. 152 of the same work.

On the map which followed an essay on the geography of Spitsbergen, by the same two explorers, in the *Transactions* of the Royal Swedish Academy of Sciences,* this "rediscovered continent" is named Giles land. We know now, however, that the real Giles Land lies further to the north; consequently Nordenskjöld and Dunér's identification is inaccurate. And, as a further consequence, these two explorers may legitimately claim to have been the first to direct the attention of geographers to the archipelago in question, for an archipelago it is, not a continent.

FIG. 8.—KING CHARLES LAND, FROM THE SUMMIT OF THE WHITE MOUNTAIN.
(*From a sketch by N. Dunér*, 1864.)

According to a communication made through *Petermanns Mitteilungen* by Prof. A. Newton, the land which the two Swedish explorers thus discovered was likewise seen in the same year and the same month by the Englishman Birkbeck. We read, "In August, 1864, Birkbeck, sailing further to the east, came in sight of Gillis (Giles) Land, which was seen by the Swedish expedition from the summit of White mount (3000 feet) in East Spitsbergen, and which they placed in 79° N. lat. and 28° 30′ E. long. But according to Newton's information, the land in question extends 100 nautical miles to the south, *i.e.* as far as 77° 20′

* Compare N. Dunér and A. E. Nordenskjöld, "Anteckninger till Spetsbergens Geografi," in *Kon. Svenska Vetens.-Akad. Handlingar*, vol. vi. No. 5. Stockholm. 1865.

N. lat., and in front of it lies an island 40 miles long, which he calls Helina island." *

This account agrees so ill with the real position and extent of King Charles Land, that it is difficult to avoid the conclusion that Birkbeck, like Von Heuglin and Von Zeil a few years later, was the victim of an optical illusion.

The two German explorers whom I have just named, describing what they saw in 1870 from Mount Middendorff, on the south side of Walter Thymen sound, say, "On the distant horizon, in N. 66¼° E. (magnetic meridian), we beheld a lofty flat-topped mountain, apparently entirely free from snow, with very steep sides, sloping evenly and regularly downwards—an island or foreland belonging to 'the mythical land in the east.' This mountain was probably not less than 60 nautical miles from the spot whereon we stood. And although the horizon in that direction was very hazy, nevertheless, beyond the flat-topped mountain already spoken of, we were able to make out, even with the naked eye, a long row of sharp-pointed summits, in part covered with snow, which stretched from N. 76¾° to 80° E. (*i.e.* from our standpoint), and then disappeared in the mist. Likewise to the north-east of the flat-topped mountain mass we thought we could discern another group of sharp-pointed mountain-peaks peering out of the haze. All these belong to a large continent, to which we have given the name of King Charles Land." † To those who have seen King Charles Land, it is plain that the sharp-pointed mountain-peaks which the German explorers were under the impression they saw in the extreme distance were merely clouds, or were due to the effects of mirage reflected from a broken sea of drift-ice; as, indeed, Kükenthal has already suggested (see below). There are no sharp-pointed mountains anywhere on King Charles Land. The flat-topped mountain mass which Von Heuglin and his companion saw was without doubt the very same that Nordenskjöld and Dunér sighted. But the vast continent of King Charles Land, which was trumpeted abroad as such a great discovery and set out on a number of maps, has no real existence.

To the high tableland on the west, which Von Heuglin identified with the flat-topped mountain-land seen by Nordenskjöld and Dunér, he gave the name of Swedish foreland, whilst the other illusory land was christened King Charles Land, after the reigning king of Würtemberg. The same name was also given to the real King Charles Land by Prof. Mohn,‡

* *Petermanns Geog. Mitteil.*, Ergänzungsband iv. part 16, p. 13. 1865.

† Th. von Heuglin, 'Reisen nach dem Nordpolarmeer in den Jahren 1870 und 1871,' i. p. 179. Braunschweig. 1872. See also Th. von Heuglin, "Aufnahmen in Ost-Spitzbergen im Sommer 1870," in *Petermanns Mitteil.*, 1871, p. 176.

‡ H. Mohn, "Norske Fangst-Skipperes Opdagelse af Kong Karl-Land,' in *Videnskabs-Selskabets i Kristiania Forhandlinger* for 1872; and "König Karl-land im Osten von Spitzbergen und seine Erreichung und Aufnahme durch norwegische Schiffer im Sommer 1872," in *Petermanns Mitteilungen*, 1873, p. 121, plate vii.

in his first attempt to lay down a map of that region on the basis of information supplied by Norwegian sealing captains; but in so doing he desired to commemorate, not the King of Würtemberg, but Charles XV., King of Sweden and Norway, for it was in the last year of this king's reign that the first landing was made on the islands in question. One of Mohn's captains, Nils Johnsen, had landed on the east side of the archipelago, whilst two others, Captains J. Altmann and Johan Nilsen, sailed more or less close to its shores. The accompanying sketch-map * (Fig. 9), which Prof. Mohn put forward as being distinctly nothing more than a first rough attempt, embodies the information he collected from these sources. From Mohn's paper, it appears that the

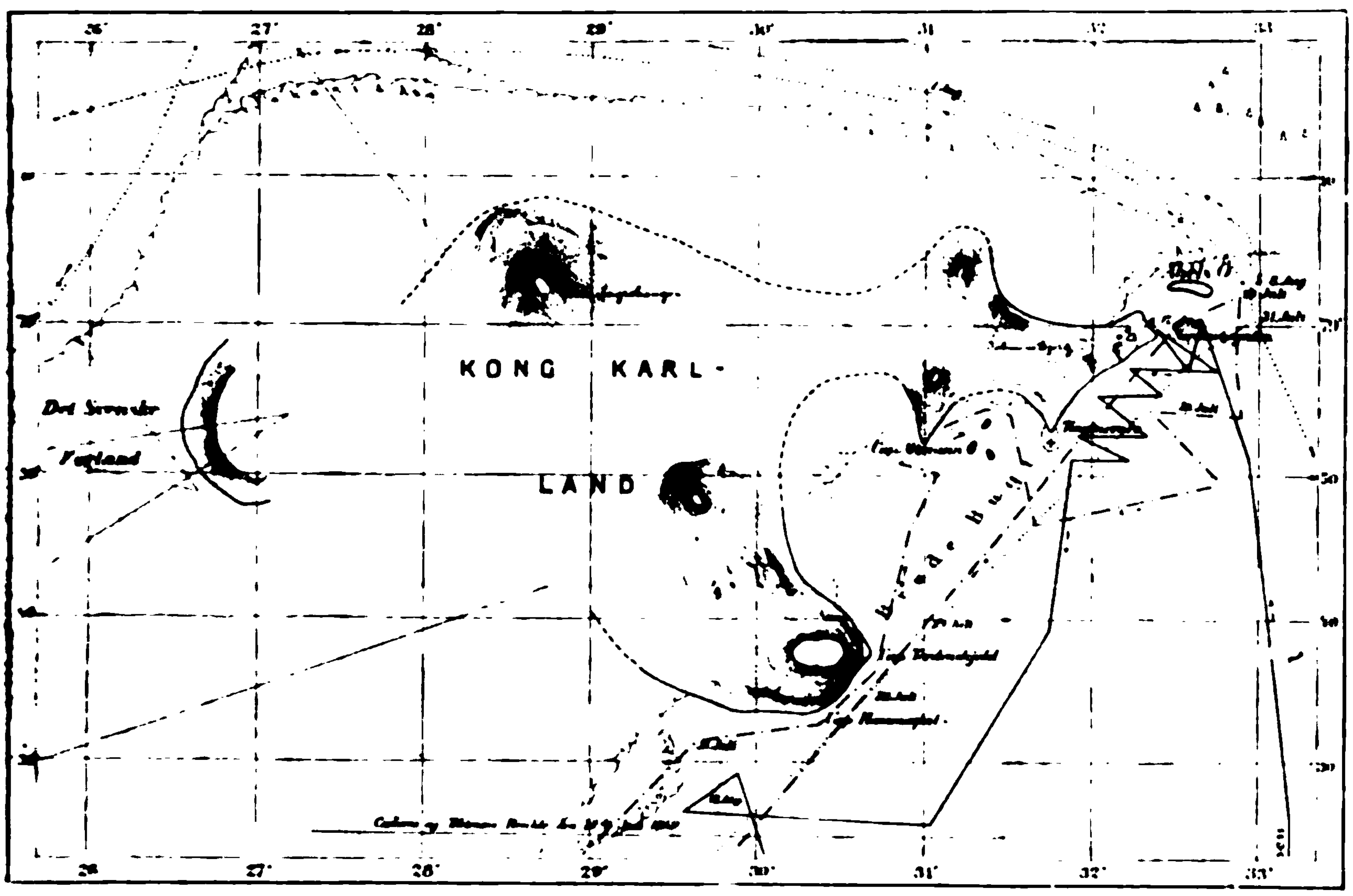


FIG. 9.—KING CHARLES LAND. REDUCED FACSIMILE OF MOHN'S MAP OF 1872.

islands were also seen from a greater or shorter distance by Captain Elling Carlsen in 1859 and 1863, by Captain S. Tobiesen in 1864, and by Captain Ulve in 1871 (from Thumb point).

Altmann and Johnsen placed at Mohn's disposal, not only their observations, but also two sketches of so much of the islands as they respectively saw, and these sketches form the foundation of his map. Altmann's map, notwithstanding its obvious shortcomings, affords the better general view of the archipelago as a whole, whilst Johnsen's gives the best outline of the eastern part of King Charles island. In order to satisfy myself as to the correctness of the identifications

* For the sake of easier comparison all the accompanying facsimile sketch-maps are reproduced on the same scale; to this end it has been necessary to reduce most of them.

in Mohn's map, I begged him to favour me with a sight of Altmann's and Johnsen's originals. He very generously complied with my desire, for which I herewith publicly tender him my thanks. In considering the facsimile of Altmann's map (Fig. 10), which was plotted by (naval) Lieut. Mathiesen, it is important to remember that Altmann's data rest entirely upon compass-bearings and approximate calculations, so that the errors in his map are not to be wondered at. The small island lying to the east is the same as that which Johnsen calls Abel island; Altmann's Bear island is the land round Mount Johnsen, and Giles island is the western part of King Charles island, together with the two islands which lie off Cape Altmann—this higher western part being connected with the higher country round about

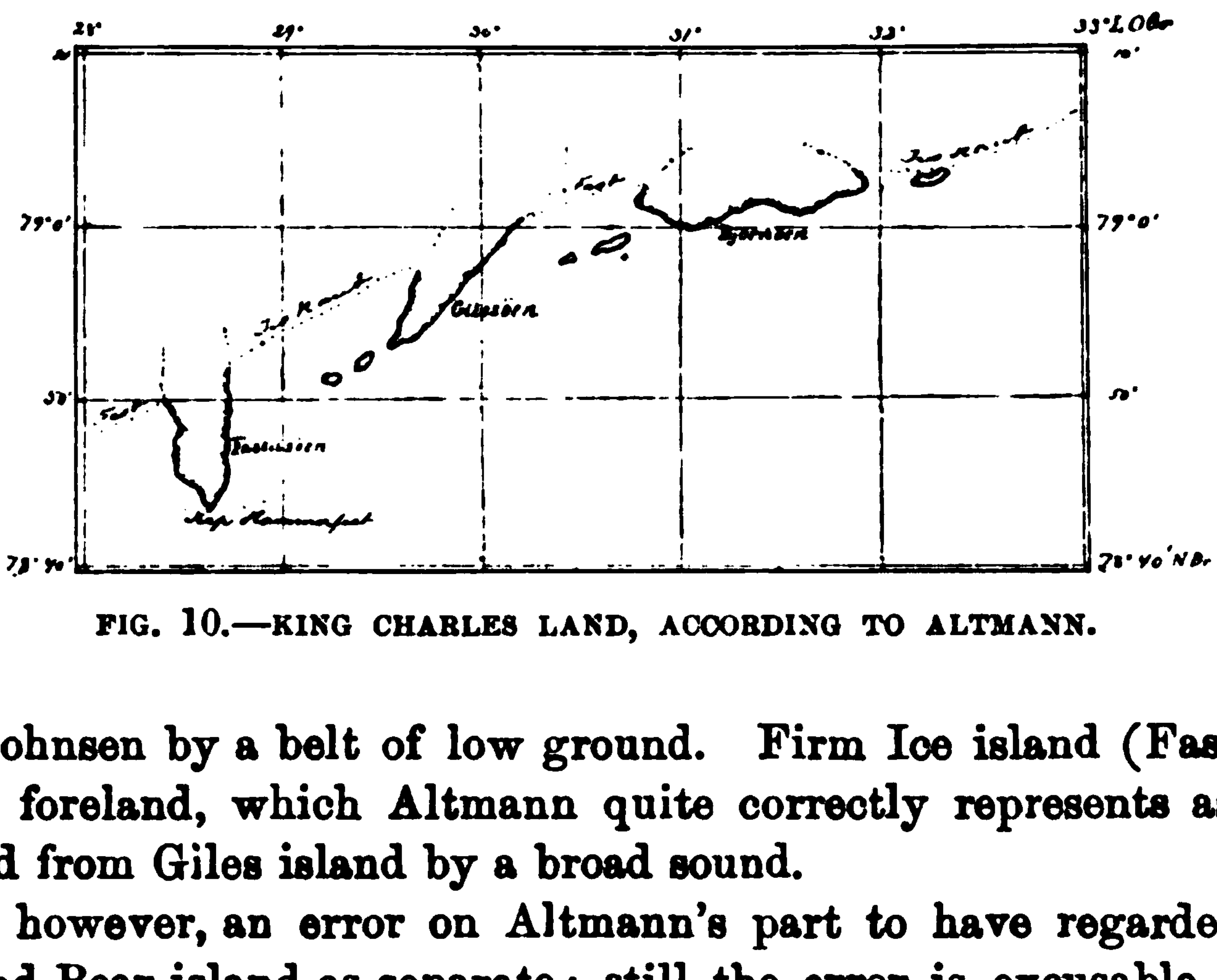


FIG. 10.—KING CHARLES LAND, ACCORDING TO ALTMANN.

Mount Johnsen by a belt of low ground. Firm Ice island (Fastisö) is Swedish foreland, which Altmann quite correctly represents as being separated from Giles island by a broad sound.

It is, however, an error on Altmann's part to have regarded Giles island and Bear island as separate; still the error is excusable, for the low tract which connects them is so low that in misty weather or from any great distance it is completely invisible. This error was, however, corrected by Captain J. Nilsen, who, in the *Freia*, sailed along the north side of the island (King Charles) in the same year.

Turning now to the sketch-map of Captain N. Johnsen (Fig. 11), which was plotted by J. C. Hansen, an instructor in navigation, the first thing that strikes the attention is the correctness with which the contours around Mount Johnsen and Timmerness are delineated, as also the situation of Hårfagrehaugen. But the same cannot be said of the south coast, for all that portion of it which lies west of Timmerness is carried very much too far to the south. If, however, we turn the map so that the coast between the ness just named and Cape Tordenskjold falls into a due east-west direction, the map will then give us not at all a bad representation of Broad bay. In that case Cape Tordenskjold answers to the high plateau of (Altmann's) Giles island; whilst

Johnsen does not appear to have observed the low promontory (Cape Altmann) which projects from the southern side of the island.

Johnsen's statement, that the three principal outstanding points of King Charles island—Cape Tordenskjold, Harfagrehangen, and Mount

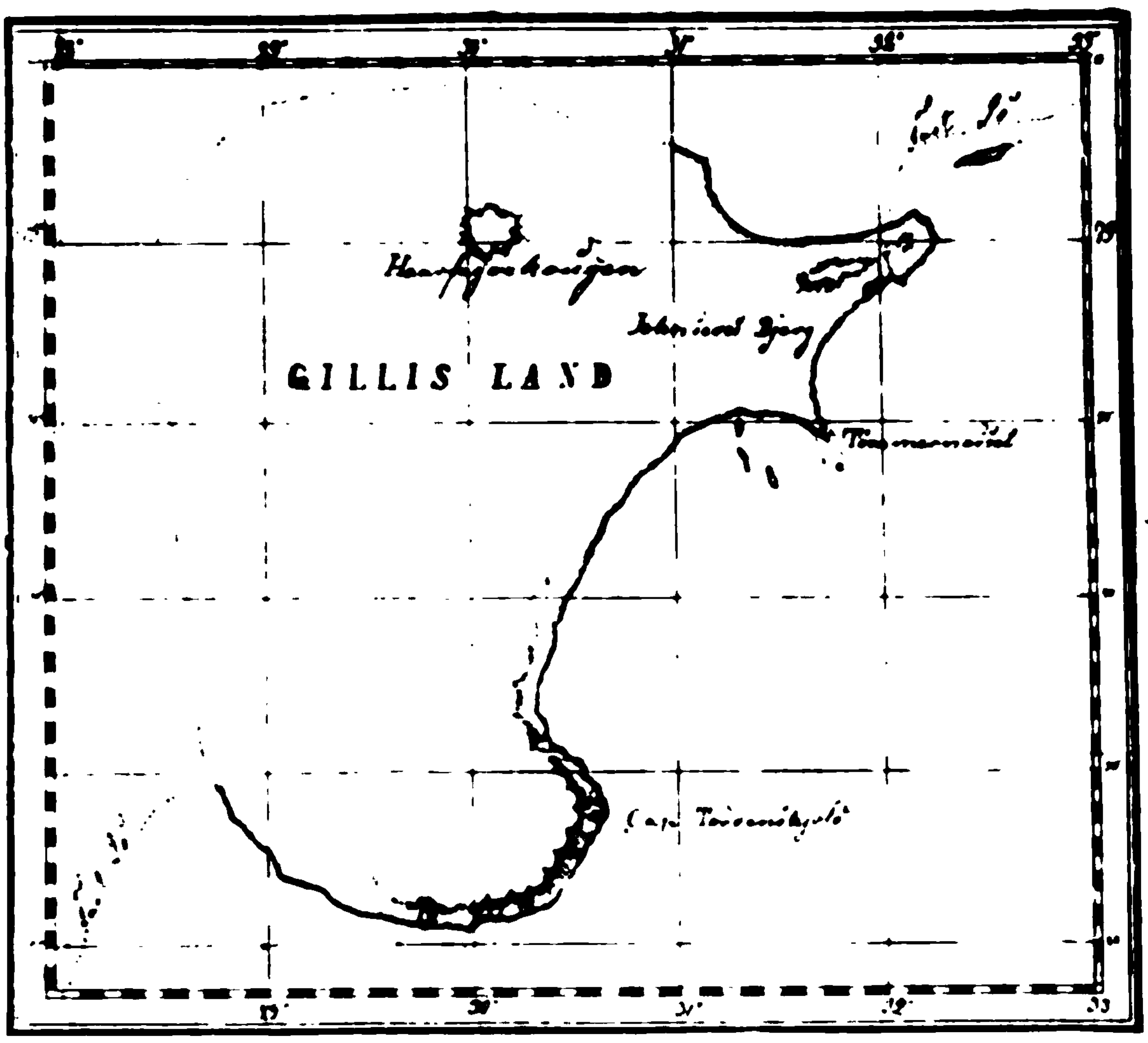


FIG. 11.—KING CHARLES LAND, ACCORDING TO N. JOHNSEN.

Johnsen—when seen from a little distance away, look like three separate islands, agrees fully with the contour sketch which I made of King Charles island from south-east on August 16 (Fig. 12). Indeed, seen from a still greater distance, the western portion again seems to be

FIG. 12.—KING CHARLES ISLAND, FROM THE SOUTH-EAST.

divided into two, so that in all there appear to be four separate islands (Fig. 13). From all this I am not disposed to accept the identification of Cape Tordenskjold with the southern extremity of Swedish foreland;

FIG. 13.—KING CHARLES ISLAND, FROM THE SOUTH-EAST, DISTANT VIEW.

I think, rather, there cannot exist the smallest doubt that Johnsen saw nothing more than King Charles island, and did not see Swedish foreland at all.

In 1884 the two sealing captains, H. C. Johannesen and Hemming

Andreasen, reported the discovery of two new islands lying to the east of King Charles Land. But I do not propose to dwell upon their observations (printed by Karl Pettersen in *Ymer*, p. 223, for the same year), seeing that they are admittedly erroneous. King Charles island was seen at such a great distance as to present the appearance of distinct islands, as K. Pettersen, Kükenthal, and Pike have each pointed out.

Altmann's statement, that there existed a sound between Swedish foreland (Firm Ice island) and King Charles island (Giles island), was not definitely proved until the year 1889, when Captain Hemming Andreasen, in his yacht the *Rivalen*, not only saw the sound in clear weather, but actually penetrated it a short distance from the north. He called it Rivalen sound, and landed on Swedish foreland. Karl

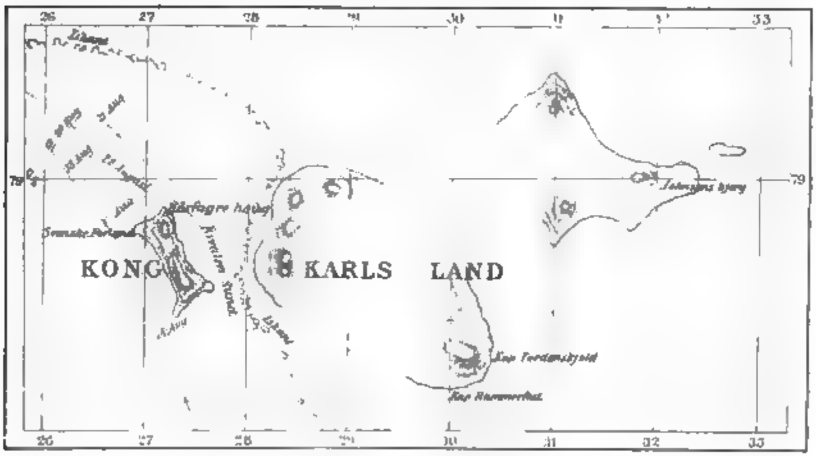


FIG. 14.—KING CHARLES LAND, ACCORDING TO ANDREASEN AND PETTERSEN.

Pettersen gave an account of Andreasen's voyage in *Ymer* * for that same year, and along with his paper printed a map upon which Swedish foreland is represented more accurately, both in respect of size and of shape, than on any previous map, as may be seen by a comparison of the facsimiles of Pettersen's map (Fig. 14) and the map accompanying this paper. The principal error on the former is the long promontory which runs out to the north-west on Swedish foreland.

It is, however, a mistake on Pettersen's part to put Hårfagrehaugen at the northern extremity of Swedish foreland, though I must in justice admit that he does so with some hesitation. The isolated mountain to which Johnsen gave this name (after the Norwegian king, Harald Hårfagre) really stands on King Charles island, and was seen by him from the summit of Mount Johnsen. I have stood on the same spot with

* K. Pettersen, 'Kong Karls Land i det östspitsbergske Hav,' in *Ymer*, 1889.

Johnsen's description in my hand, and I venture to affirm that there cannot exist a moment's doubt as to the identity of Hårfagrehaugen; there is absolutely no choice in the matter. The most convincing proof that Johnsen cannot possibly, by Hårfagrehaugen, have meant the northern extremity of Swedish foreland lies in the fact that the latter is not visible at all from Mount Johnsen, but is completely hidden by the intervening western plateau of King Charles island.

It is also a mistake, which has been repeated again and again, to put Cape Hammerfest on King Charles island; in reality, as the southern point of Firm Ice island, it belongs to Swedish foreland.

Previous to Andreasen's visit, Prof. W. Kükenthal, of Jena, on board the sealer *Cecilie Malene*, Captain Magnus Arnesen, had that same summer approached the islands four times, though without landing

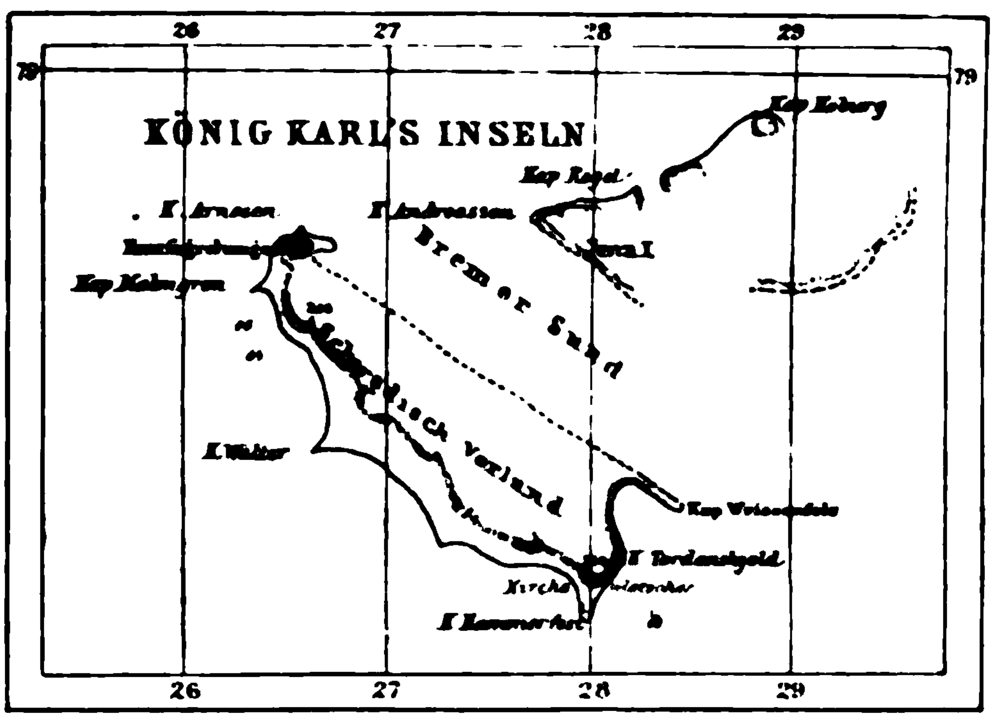


FIG. 15.—KING CHARLES LAND, ACCORDING TO KÜKENTHAL.

upon them. On the third and fourth occasion when he approached them the weather was beautiful and clear, and Kükenthal claims to have been able to see all over the archipelago from its north side. It is, however, plain that of King Charles island he saw nothing more than the extreme western portion. He sailed quite close to the western and southern shores of Swedish foreland, and it is upon the observations there made that he drew out the map which accompanied his paper, printed in 1890.* That map (Fig. 15), and the remarks which explain it, prove how easily even the most careful and conscientious observer may fall into error, unless he grounds his observations upon actual definite measurements.

* "Die von der Geographischen Gesellschaft in Bremen veranstaltete Forschungsreise in das europäische Eismeer," in *Deutsche Geographische Blätter*, xii. (1889), Bremen; "Bericht über die von der Geographischen Gesellschaft in Bremen im Jahre 1889 veranstaltete Reise nach Ostspitzbergen," in *Petermanns Mitteilungen*, 1890; "Forschungsreise in das europäische Eismeer," in *Deutsche Geographische Blätter*, xiii. (1890), Bremen.

In the first place, Swedish foreland, as shown on Kükenthal's map, is nearly three times too large, and extends considerably further to the south than the actual foreland does. Kükenthal condemns Andreasen's map, saying, "In my opinion this sketch-map is incorrect. There exists no such small island in the west as that which he shows." But in this Kükenthal is himself quite in error. In this particular, Andreasen's map answers more accurately to the real situation of the islands in the archipelago than does Kükenthal's own. As a matter of fact, the southern extremity of Swedish foreland lies in what is the middle point of Kükenthal's "Schwedisch-Vorland." Again, the northern eminence of Swedish foreland is wrongly identified with Hårfagrehangen, for this, as I have already shown, must be placed on King Charles island. It is no less an error to name the southern extremity of the foreland Cape Tordenskjold. Nor can the statement be accepted that the summits which Nordenskjöld and Dunér saw from the top of White mount in 1864 were nothing more than Hårfagrehaugen, as is proved by a single glance at the sketch by the latter. Further, the outline of Swedish foreland on Kükenthal's map is altogether misleading. The long narrow tongue of land marked "Cape Weissenfels" has no such existence; the bay is too deep at that point. The glacier which is represented at Cape Hammerfest is nothing more than a snow-drift. The height of the mountain there is considerably exaggerated, being given as 1180 feet instead of 590 feet, its actual height. The little island, Antarctic island, that lies north-west of the south-western extremity of the foreland finds no place at all in Kükenthal's map.*

If Swedish foreland, which Kükenthal sailed close alongside, is thus incorrectly mapped, it can hardly be expected that King Charles island, which he merely saw from the distance, should be laid down with any greater degree of accuracy. Kükenthal's Cape Coburg, the northernmost mountain, "with a flat-topped summit," is presumably Hårfagrehaugen. His Cape Regel has, in reality, no existence at all. And the somewhat dubious sound is the low ground that lies to the north of the pass between Mount Sjögren and Mount Tordenskjold. As the southern coast is only indicated by a dotted outline on Kükenthal's map, I need not further delay with it.

Kükenthal gave to the eastern island—that is, to King Charles island—the name of Jena island. I entirely fail to see by what right the German professor bestowed this name upon it. The island was originally discovered by Norwegian sealers or whalers, and they called it Giles island and Bear island. When Prof. Mohn drew up his map of

* The reason that Kükenthal's map has never been properly criticized by the Norwegian geographers seems to have been due, as I gather, to the death of Karl Pettersen happening just about that time. This is all the more to be deplored, because the English sea-chart of King Charles Land has been based upon Kükenthal's map.

King Charles Land, he did so on the supposition that the observations of the Norwegian skippers all had reference to the eastern part or the eastern island; but as regards the western part, seen by Nordenskjöld and Dunér, he did not know certainly whether it was or was not continuous with the eastern part, nor did he know, either, whether it had actually been seen by the Norwegian skippers. Accordingly, he called it Swedish foreland (Det Svenske Forland). Since, however, we now know that the foreland is separated from the chief island by a sound, Mohn's designation must, of course, be retained for the latter, with the slight substitution of "island" for "land," so that the general name of King Charles Land may be reserved for the archipelago as a whole. Thus, just as in the New Siberian group one of the islands is called New Siberian island, so in the King Charles group the largest individual island is called King Charles island, and in doing this we encroach upon no man's rights. Nay, the name King Charles island was thus used before us by the Englishman Pike. If any other name than this is to be given to the island, then unquestionably the Norwegian names are entitled to the priority, though neither of them is so appropriate as King Charles island. Had Prof. Kükenthal mapped the island or explored it, or even landed on it, his attempt to impose a new name upon it might then perhaps have had some claim to consideration; but as the facts really are, he possesses the rights neither of the discoverer nor of the explorer—nay, more than that, he saw merely a fractional part of the island.

The same remarks hold good, *mutatis mutandis*, of Kükenthal's renaming of the sound (between the foreland and King Charles island), Bremer sound; for Andreasen's map, in which the sound is called Rivalen sound, was actually published several weeks before Kükenthal's. Kükenthal claims the right to name this sound because he "discovered" it prior to Andreasen. As a matter of fact, the real discoverer was Altmann in 1872. Seeing, then, that Kükenthal neither discovered the sound nor visited it, nor mapped it correctly, it seems to me self-evident that to Andreasen, who was the first navigator, so far as we know, to sail its waters, and whose map of it unquestionably enjoyed priority of publication, clearly belongs the right to give it what name he pleases. It is for this reason that I retain the name Rivalen sound on my map accompanying this paper.

In 1897 King Charles Land was visited by Mr. Pike, who, on his return home, published in this *Journal* (April, 1898) an illustrated account of his voyage. The paper was not illustrated by any map; but I have no doubt that Mr. Pike's observations are embodied in the latest official English sea-chart * of the polar regions (Fig. 16). On this chart King Charles island is delineated with greater accuracy than

* 'Arctic Ocean and Greenland Sea.' No. 2282. London. 1898.

on any previous map, although Cape Altmann is not indicated sufficiently far to the west, so that Broad bay is too short measured from east to west. Mr. Pike calls it Victoria bay; but the name of Broad bay, which it has received on Mohn's map, deserves the priority. It is, I presume, an error on the part of the English lithographer that "Johnsen B." is placed at a bay instead of a mountain.* Swedish foreland is an exact

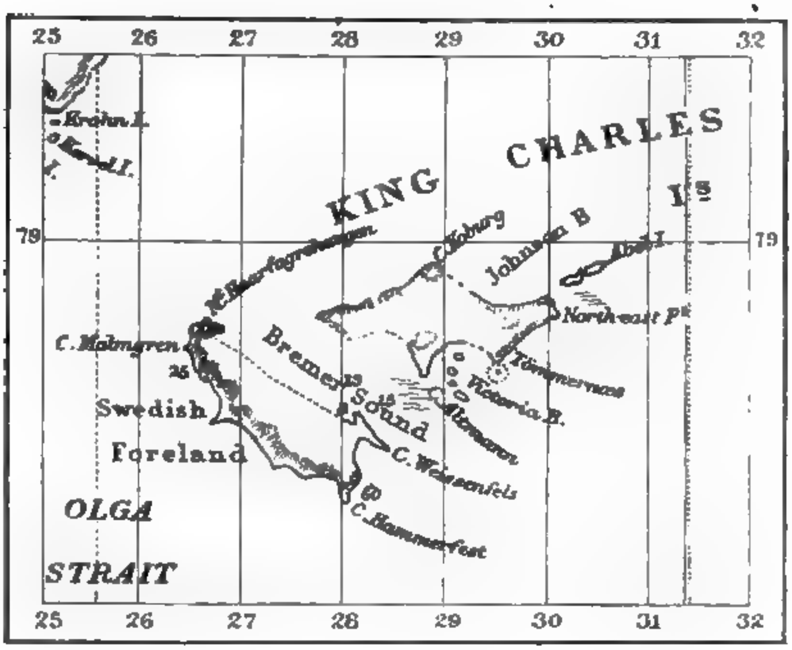


FIG. 16.—KING CHARLES LAND, ACCORDING TO ENGLISH SEA-CHART, 1898.
(*Facsimile, magnified.*)

reproduction of Kükenthal's map, with all its errors uncorrected, and in his text, too, Mr. Pike speaks of Hårfagrehaugen being situated at the northern extremity of the foreland. The real Hårfagrehaugen is shown in the two illustrations on p. 367 of Mr. Pike's paper. Mr. Pike's account of the islands, notwithstanding its brevity, contains a good deal of really useful information.†

(*To be continued.*)

---

* Johnsen's B. on Mohn's map in *Peterm. Mitteil.* means Johnsen Berg. ("Berg" = mount.)

† In several places I read of "dolomite;" this is, I presume, a misprint for "dolerite." Mr. Pike's statement, that the position of Cape Weissenfels, as determined by an observation of latitude, agrees with its position as shown on the map, must surely be an error.

THE BATHYMETRICAL CONDITIONS OF THE ANTARCTIC REGIONS.

By HENRYK ARÇTOWSKI, of the Belgian Antarctic Expedition.

THE scientific work of the Belgian Antarctic Expedition was commenced in the channels of Tierra del Fuego, and after the vessel left the pack they were concluded at Punta Arenas. It is thus impossible to discuss the physical geography of the antarctic regions in general without including the scientific results of the expedition of the *Belgica*.

The works of Murray, Neumayer, Fricker, and others,* give a general account of the state of our knowledge of the antarctic regions, and therefore I prefer to give in a series of articles a short summary of the results obtained by the Belgian Antarctic Expedition from the point of view of oceanography, geology, meteorology, and ice-conditions.

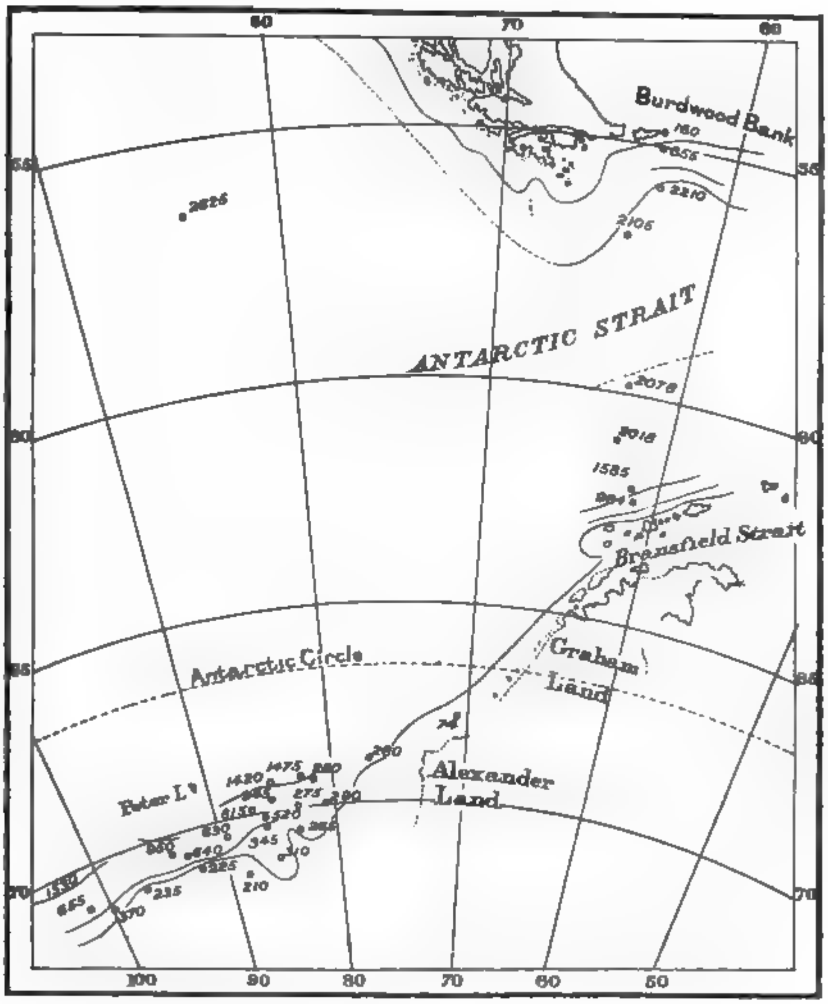
The *Belgica* had the advantage of navigating a region in which no previous bathymetric researches had been made, and her soundings have a special value (although their actual number was not great) because they were not taken at random. On the voyage from Staten island to the South Shetlands, a line of soundings was run nearly from north to south, giving a transverse section of the "antarctic channel" which separates the Andes from one of the projecting angles of Murray's hypothetical antarctic continent. In another place also, beyond the antarctic circle, and to the west of Alexander I. Land, we were able to obtain a series of soundings, some before entering the ice, the others on account of the drift of the vessel when imprisoned in the pack. The soundings on our way southward are given in the Table as Nos. 1 to 9, and those taken between 70° and 107° W. as Nos. 10 to 56, while the results are represented cartographically in the two maps.

The first map shows the probable arrangement of the depths to the south of Cape Horn and in the antarctic regions. Soundings Nos. 1, 2, and 3 prove that south of Staten island the continental shelf is very narrow, and terminates seaward in an abrupt slope, the greatest depth sounded (2209 fathoms) lying, in fact, very near the island. To the east,

* G. Neumayer, 'Die Erforschung des Süd-Polar Gebietes.' Berlin: 1872.
  „ "Ueber Südpolarforschung" ('Report of the Sixth International Geographical Congress, London, 1895').
  Sir John Murray, "The Renewal of Antarctic Exploration" (*Geogr. Journal*, January, 1894); and the "Narrative" of the *Challenger* Reports.
  K. Fricker, 'Entstehung und Verbreitung des Antarktischen Treibeises.' Leipzig: 1893.
  K. Fricker, 'Antarktis.' Berlin: 1898.
  For bibliography, see T. Chavanne, 'Die Literatur über die Polar-Regionen der Erde' (Wien: 1878); and the 'Antarctic Number' of the *Scottish Geographical Magazine* (October, 1898).

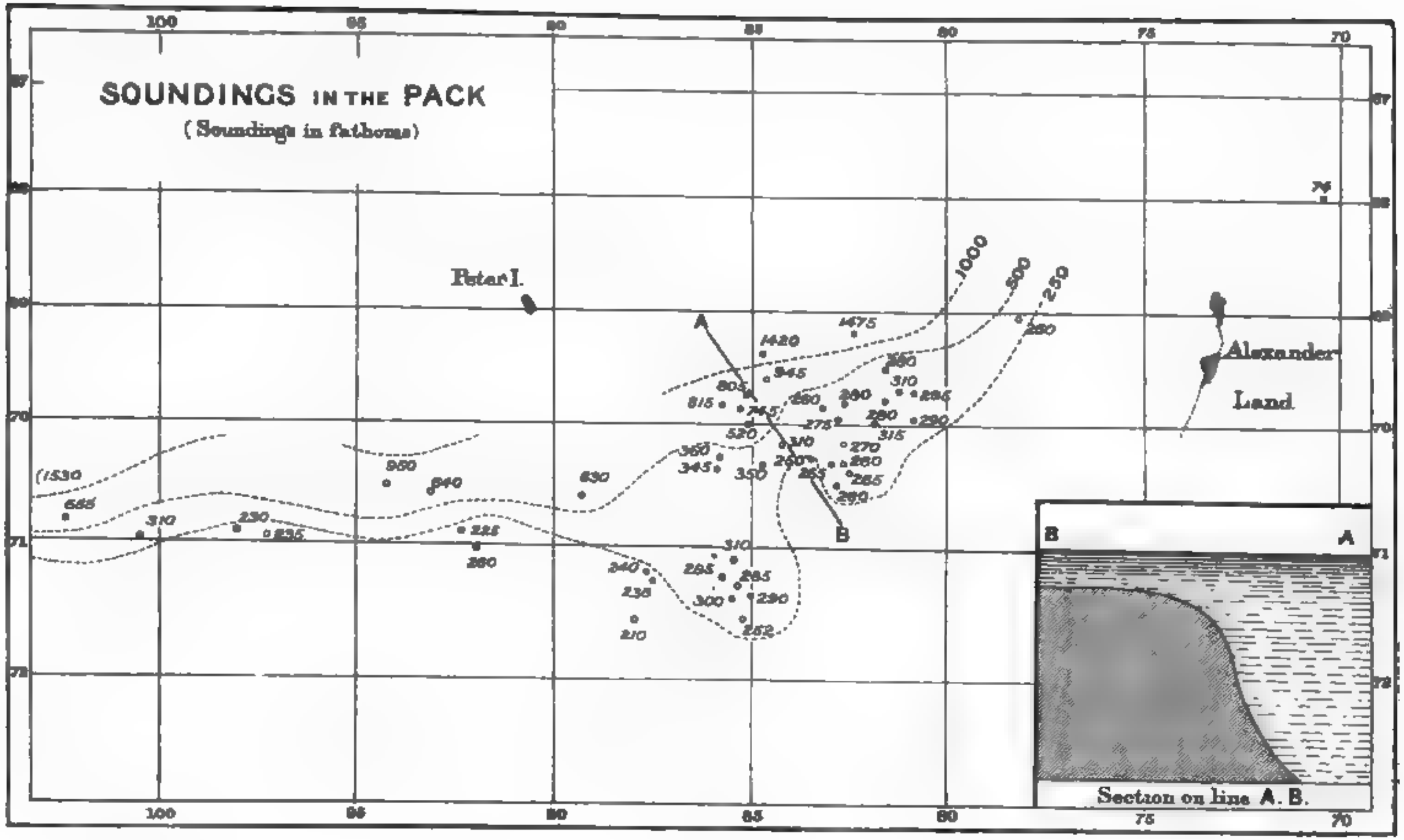
on the contrary, the continental shelf extends to a great distance as Burdwood bank.

Between the southern versant of the Andes and the mountain system forming the framework of the antarctic lands visited by the expedition, there lies a deep, flat-bottomed depression, the floor of

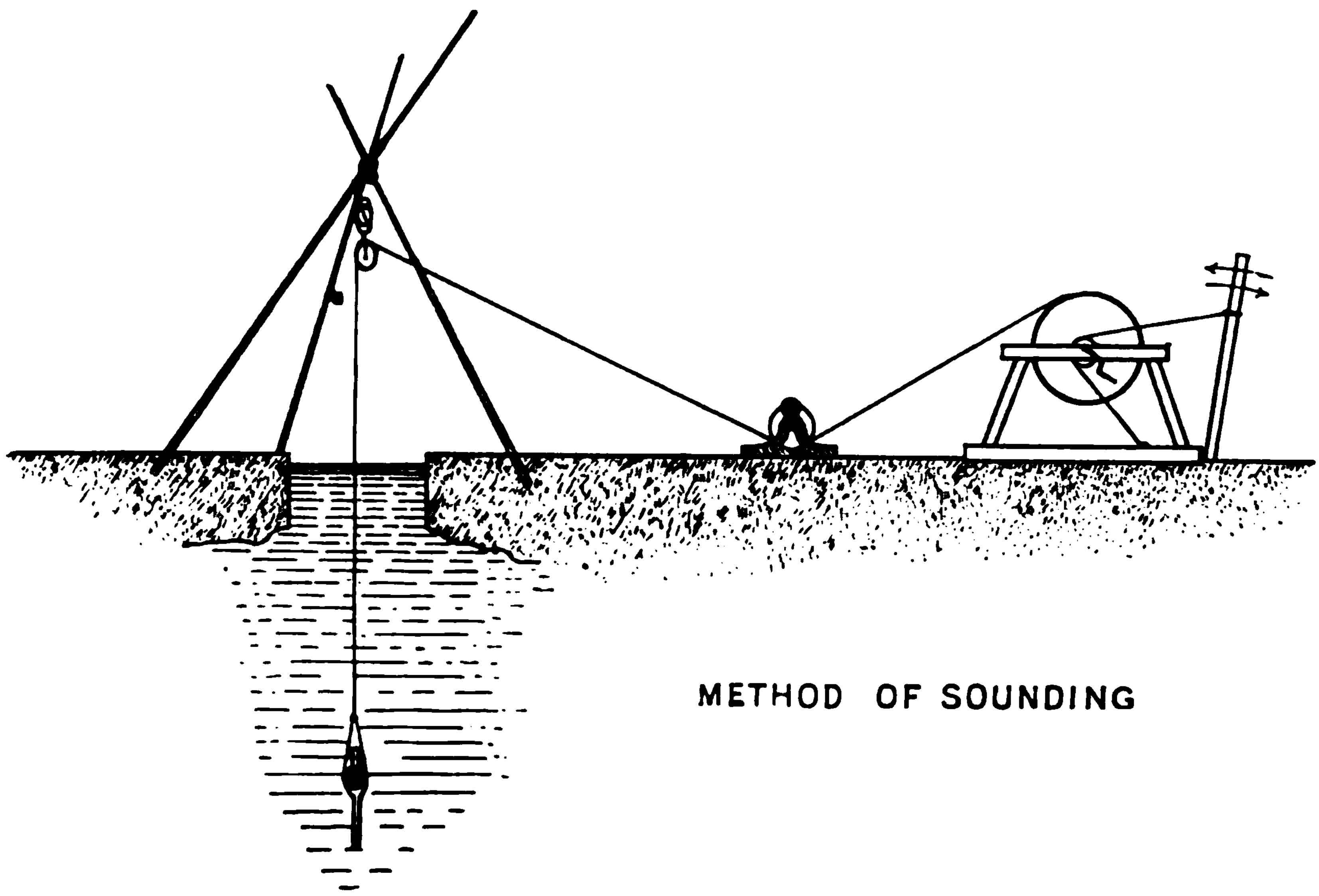


THE ANTARCTIC STRAIT

which rises gently towards the south, and not far from the South Shetlands an abrupt slope leads up to the rocky shallows near Livingstone island. The last sounding taken gave a depth of 2625 fathoms in 56° 28′ S., and 84° 46′ W., proving that the depth increases towards the Pacific ocean. As, on the contrary, the Sandwich group, South


SOUNDINGS IN THE PACK
(Soundings in fathoms)
Peter I.
Alexander
Land
Section on line A. B.

Georgia, and Shag rocks lie to the east, it seems probable that this great basin (called Barker basin on the chart in the *Challenger* Reports) does not extend to the east of these islands. In a note on the interest which attaches to the geological exploration of the lands in the far south, which I published in December, 1895,* I suggested that "Graham Land is connected with Patagonia by a submarine ridge, which forms a great arc extending between Cape Horn and the South Shetland islands, and that the tertiary chain of the Andes reappears in Graham Land." I maintain this hypothesis, which demands for its satisfactory demonstration, not only the geological study of the land, but also and



METHOD OF SOUNDING

chiefly a detailed bathymetrical map. The first step to this end has now been made.

The second map, showing soundings in the pack, is on a larger scale than the first, and shows the distribution of the soundings to the west of the land, and within the antarctic circle. It clearly demonstrates the presence of a continental shelf. The section along the line AB is extremely characteristic, showing distinctly that the submarine slope is discontinuous. The submerged bank, which terminates abruptly towards the ocean, has depths of from 300 to 200 fathoms, and further south the depths are probably still less. I shall not discuss the configuration of this submarine elevation, as one might imagine it to be from the soundings taken upon it, for the soundings are not numerous enough for this to be done profitably. But I cannot refrain from calling

* *Bull. Soc. Géol. de France*, [3], xxiii. p. 589.

attention to one point which seems to me of great importance. The edge of the plateau is indicated by the isobath of 300 fathoms, beyond which the depths increase very rapidly. Now, it is the 100-fathom line which is generally accepted as the limit of the continental shelf, and it would appear possible that in the antarctic regions the continental shelf had been submerged. The discussion of this interesting question would, however, lead us too far.

It is noteworthy that the soundings carried out by the *Erebus* and *Terror* to the east of Victoria Land and north of the ice-barrier discovered by Ross, also indicate the existence of a continental shelf with much greater depths to the north. Between the two there still remains a space of 60° of longitude to explore before one can say whether they are connected.

All the positions were fixed by M. Lecointe, and I am indebted to the kindness of this accomplished astronomer for the exact place of each sounding. The sounding-machine of the *Belgica* was constructed by Le Blanc at Paris, and is similar to that employed on the *Pola* by the Austrian expedition. During the wintering in the ice, M. de Gerlache had a simple but effective arrangement constructed on board, which was fitted up on the ice close to the ship, and only required a hole to be cut in order to allow a sounding to be made. It consisted of a wooden drum carrying the sounding-wire, a brake consisting of a cord and a strong piece of wood serving as a lever to regulate the descent of the weight, and two cranks on the axle of the drum to heave in the wire. A wheel of one metre in circumference, with a counter from the Le Blanc machine, allowed the depth to be read off. The line ran through a block attached by a dynamometer to three poles arranged as a tripod. The soundings and temperature observations were laborious, and it is due to the co-operation of MM. Amundsen, Tolewsen, Johansen, Melaerts, Vanrysselbergh, and of M. de Gerlache himself that it has been made possible for me to write these notes on the bathymetrical conditions of the antarctic regions.

TABLE OF SOUNDINGS.

Date.	Depth in metres.	Fathoms.	Latitude.	Longitude W.	No.
1898.			° ′	° ′	
Jan. 14	296	162	54 51	63 37	1
„ 14	1564	855	55 3	63 29	2
„ 15	4040	2209	55 51	63 19	3
„ 16	3850	2105	56 49	64 30	4
„ 18	3800	2078	59 58	63 12	5
„ 19	3690	2018	61 5	63 4	6
„ 20	2900	1586	62 2	61 58	7
„ 20	1880	1028	62 11	61 37	8
„ 28	625	342	64 23	62 2	9
Feb. 16	135	74	67 59	70 40	10
„ 19	480	262	69 6	78 21	11

Date.	Depth in metres.	Fathoms.	Latitude.	Longitude W.	No.
1898.			° ′	° ′	
Feb. 23	565	309	69 46	81 8	12
„ 24	510	279	69 31	81 31	13
„ 25	2700	1476	69 17	82 25	14
„ 27	2600	1422	69 24	84 39	15
„ 27	1730	946	69 41	84 48	16
Mar. 1	570	312	71 6	85 23	17
„ 1	520	284	71 17	85 43	18
„ 2	460	251	71 31	85 16	19
„ 4	530	290	71 22	84 55	20
„ 5	520	284	71 19	85 29	21
„ 9	554	303	71 23	85 33	22
„ 20	390	213	71 35	88 2	23
April 22	480	262	71 2	92 3	24
„ 26	410	224	70 50	92 22	25
May 4	1150	629	70 33	89 22	26
„ 20	435	238	71 16	87 38	27
„ 26	436	238	71 13	87 44	28
Sept. 2	502	274	70 0	82 45	29
„ 9	510	279	69 51	82 36	30
„ 14	480	262	69 53	83 4	31
„ 22	485	265	70 23	82 31	32
„ 26	485	265	70 21	82 52	33
„ 29	480	262	70 21	82 39	34
Oct. 7	480	262	70 30	82 48	35
„ 16	532	291	69 59	80 54	36
„ 19	580	317	70 1	81 45	37
„ 24	537	294	69 43	80 51	38
Nov. 2	518	283	69 51	81 24	39
„ 10	490	268	70 9	82 35	40
„ 28	459	251	70 20	83 23	41
Dec. 20	569	311	70 15	84 6	42
„ 22	645	253	70 19	84 51	43
„ 27	630	344	70 20	85 52	44
„ 29	660	361	70 15	85 51	45
„ 31	950	519	70 1	85 20	46
1899.					
Jan. 2	1360	744	69 52	85 13	47
„ 4	1470	804	69 50	85 12	48
„ 7	1490	815	69 52	85 32	49
Feb. 10	1166	638	70 34	93 17	50
„ 19	1740	951	70 30	94 12	51
Mar. 2	430	235	70 53	97 17	52
„ 5	425	232	70 51	97 57	53
„ 12	564	308	70 56	100 18	54
„ 13	1195	653	70 50	102 14	55
„ 23	4800	2625	56 28	84 46	56

THE OXFORD SCHOOL OF GEOGRAPHY.

For some time past there have been negotiations between the Society and the University of Oxford, with a view to the establishment there of a fully equipped school or institute of geography, which would supply a complete training in all departments of geography, not only to Oxford graduates and undergraduates, but to others who desired to avail themselves of such an opportunity. These negotiations have

terminated successfully, and it has been arranged that the school will begin operations next October, under the direction of the Reader, Mr. H. J. Mackinder. The Society will contribute £400 annually for five years out of the £800 required, and the school will be under the supervision of a joint committee of representatives of the Society and the University. At a recent meeting of the committee, the staff was appointed, Mr. Mackinder being the head of the school, and dealing specially with Historical Geography; Mr. A. J. Herbertson, PH.D., has been appointed assistant to the Reader, and will deal with Physical Geography, Cartography, and Surveying; Mr. H. N. Dickson has been appointed Lecturer on Physical Geography; and Mr. G. B. Grundy will lecture on Ancient Geography in 1899-1900.

The work of the school will include a course of systematic instruction primarily intended for graduates and other advanced students, with classes, demonstrations, and practical work in physical geography, cartography, and surveying. Courses of lectures will also be given with special reference to the historical and scientific teaching of the University. The work will be carried on for five days each week during term.

The lecture-room and laboratory will be in the Old Ashmolean Museum, the upper floor of which is being fitted with the necessary appliances.

The importance of this latest development in the efforts which the Society has been making for fifteen years to obtain adequate recognition of geography in higher education in this country, need not be insisted on. There is every reason to hope that the school will not only fill a useful function in the University, but have considerable influence on the position of geography in our public schools.

ADMIRALTY SURVEYS DURING THE YEAR 1898.

UNDER the orders of the Lords Commissioners of the Admiralty, eight of Her Majesty's vessels with three small hired steam-vessels, manned by 75 officers and 639 men, have been employed on hydrographical surveys on the home and foreign stations. A naval officer, assisted by officers of the Royal Indian Marine, has also been employed, with the sanction of the Admiralty, under the Indian Government.

The following is a brief summary of the work accomplished, as detailed in the report prepared for presentation to Parliament. The number of newly discovered rocks reported still increases; reports of two hundred and thirty rocks and shoals, which were dangerous to navigation, have been received at the Hydrographic Department, and were notified to the public by Notices to Mariners; 750 miles of coast have been charted, and an area of 10,435 miles has been sounded.

On the east coast of Scotland, a survey of the river Forth between Alloa and Port Edgar was completed.

The survey of Cromarty and Inverness Firths and their immediate approaches was taken in hand, and will be completed next year.

The set of the tidal streams was observed at several positions on the east coast of England.

On the east coast of England :—The following surveys were carried out.

Chatham, Upnor, Cockham and Short reaches were resurveyed on a large scale; this survey showed that the approach to the dockyard locks has less water than formerly, and that the area, which requires constant dredging to enable the basins to be used by battleships, has increased.

The shingles patch in the Duke of Edinburgh channel was resounded; its steady growth since 1882 has reduced the width of the Duke of Edinburgh channel from 1½ mile to about ½ a mile.

The Middle Swin was resurveyed; this passage way has of late years much contracted and shoaled. There is now little more than 19 feet on the bar at low water.

The survey of the Yorkshire coast was continued from the previous year, and completed from abreast of Huntcliff to a little eastward of High Whitby, the soundings being carried out to a distance of 5 miles from the land.

Holy island was surveyed on a large scale, and showed less water in the fairway of the harbour, and large changes in the forms of the sandbanks. It is sixty-five years since this place was surveyed.

Mouse Sand was resurveyed, and large changes were found to have taken place; the dry portion of the sand at low water had contracted to half its last recorded size.

On the south coast of Ireland, a new survey was made of the river Barrow; considerable changes were found to have taken place in the lower reaches. The Rusk and Arklow banks at their southern extremes were resounded, and were found to have extended to the south-westward.

The survey of the Scilly isles was resumed, and nearly completed.

On the west coast of Scotland :—A survey of Loch Ryan was begun, and will be completed in 1899. In the course of the work, a shoal of 15 feet was discovered in the entrance of the harbour.

The recently dredged areas in Plymouth and Portsmouth harbours have been closely examined.

On foreign and colonial shores :—The survey of the Strait of Belle Isle, Newfoundland, which was begun last year, was resumed and completed, and it is hoped, will be of great service to vessels navigating the strait, as marked differences in the depths in various parts of it exist, and will greatly tend to aid a vessel in a fog or thick weather.

The survey of White bay, which was begun last year, was resumed and completed.

In the West Indies, at Trinidad :—A survey was made of the Serpent's Mouth, together with a more extensive plan of the vicinity on a smaller scale. Deep-sea soundings in selected positions were obtained between Bermuda Island and Sierra Leone.

On the west coast of Africa, a survey of Sierra Leone was begun, and will be completed in the early part of next year.

On the west coast of North America :—Baynes sound and its approaches were re-surveyed, and a large plan of Port Augusta was also made.

The longitudes of Esquimalt and Vancouver were determined by exchange of telegraphic signals between those places and the McGill College Observatory at Montreal; these longitudes will establish on the Pacific coast, positions which will serve as initial points for meridian distances.

Magnetic observations with absolute instruments were taken at Coburg peninsula, near Esquimalt; Brockton point, Vancouver; Beak point, Denman island; and Maple spit, Baynes sound.

Nanaimo harbour was triangulated, and the survey will be continued next year.

In the Red sea and Mediterranean sea:—A series of current observations were taken in the large strait of Bab-el-Mandeb. The results of those observations have been published in a 'Report on the Under-currents of the Straits of Bab-el-Mandeb.' Unsuccessful searches were made for the reported shoals King Arthur and Akbar.

A detailed survey of the harbour of Alexandria on a large scale has been completed.

In Tasmania:—The river Derwent, from Government house to Risdon ferry, has been surveyed in detail on a large scale.

In New South Wales:—An examination of the eastern channel to Sydney harbour was made to ascertain the changes in depth since the survey in 1887.

Deep-sea soundings were taken in selected positions in the South Pacific, between Sydney and Auckland, New Zealand, and from Auckland to the eastward, across the deep depression south-east of the Tongan group, which was discovered in 1895. The limit to the eastward was defined, showing it to be a narrow gutter running north and south.

In the South Pacific:—Vavau and Haapai groups were surveyed, and from Vavau to Kao was surveyed on a smaller scale. Detailed plans were made of Ufulanga island anchorage, Neifu anchorage and its approaches, both on a large scale.

Many of the reported dangers between Vavau and Haapai, also between Letté and Kas islands, were disproved. Metis island, a volcanic island which originated from an eruption in 1875, has now completely disappeared; there is a breaking reef where the island formerly existed.

The edge of the bank on which the Nomuka group stands was completed on all sides, and also the northern edge of the bank on which Tongatabu stands. The North Star reef and Disney reef were searched for, but without success. It seems probable that the *North Star* touched on one of the reefs eastward of Kelefesia, and that Disney reef is identical with a shoal patch on the Falcon bank, which is in the same latitude, but 25 miles westward of the position, in which the "Disney reef" was reported.

A large area eastward of the Haapai group was sounded over during a search for the sandbank reported in that locality, but nothing was discovered.

Fanui Lai and Taku islands were surveyed on a small scale, and an ineffectual search made for breakers, which had been reported westward of Tongatabu.

A line of soundings was carried from Nukualofa to Sydney, passing over the position of Falcon island, and the report of its disappearance was verified. Falcon island has had even a shorter existence than Metis island. Emerging from the sea in 1885 as an island about 2 miles long and 160 feet high, composed entirely of ashes, it has been washing away ever since, and is now merely a breaking reef. After passing the position of Falcon island, a zigzag line of soundings was made to the westward and along the latitude of the dangers west of Honga Tonga; nothing suspicious was found. From thence to Sydney soundings were taken at close intervals.

Magnetic observations with absolute instruments were obtained at Neiafu and Lefuka in the Tongan group.

In China:—A detailed survey of Wei-hai-wei and its approaches was made, also a land survey of the west portion of the island of Leu-Kung-tau. The anchorage at Leu-Kung-tau was examined by boring in forty-two positions, to ascertain the depth of the mud and its consistency.

A triangulation of Tinghai, in the Chusan archipelago, was made, and the lower harbour was sounded.

In Queensland:—The survey was resumed inside the barrier reefs northwards of Cooktown, and completed from Morris island to 3 miles south of Claremont point.

Magnetic observations were obtained at Morris island, Burkitt island, and Cairus.

In India:—A plan was made of the port of Moulmein, and the greater part of the survey of the Moulmein river was completed by the end of the year.

The survey of the Gulf of Martaban was completed, which was begun in 1897. The soundings showed a great decrease in depth near the southern part of the gulf. This survey was delayed by an outbreak of cholera caused by drinking Moulmein river-water.

Magnetic observations were made in the Bay of Bengal; and the usual sounding and dredging operations carried out *en route* between Bombay and Moulmein.

During the year the Hydrographic Department has published ninety-eight charts and plans, and improved twenty-eight plates by the addition of forty new plans; 235 plates have been largely improved by corrections and additions; 4680 corrections have been made to plates by the engraver; and 32,200 charts have received minor corrections at the hands of the draughtsmen.

The number of charts printed for the requirements of the Royal Navy, for Government Departments, and to meet the demand of the general public, has, during 1898, amounted to 447,907.

SEVENTH INTERNATIONAL GEOGRAPHICAL CONGRESS: EXCURSIONS.

A circular has been issued by the Bureau of the Seventh International Geographical Congress, giving full particulars of the excursions which have been arranged for before and after the meeting in Berlin, and accompanied by a copious bibliography of each of the regions to be visited. All the excursions before the Congress are so arranged, that those taking part in them will arrive in Berlin on September 27, in time for the informal meeting of welcome. Names for the excursions, accompanied by a deposit of 10*s.*, must be sent in to the Secretary of the Congress at 90 Zimmerstrasse, Berlin, S.W., not later than July 15. The probable cost of each excursion has been calculated, and the whole of the payments will be made through the leaders, the members having no trouble of any sort with regard to travelling fares or hotel bills. The excursions are as follows:—

1. *To the Rhine and Moselle.*—Prof. Rein and Drs. Philippson and Kaiser, of Bonn, will conduct two one-day excursions: on September 19, from Bonn to the Siebengebirge; and on the 20th, from Bonn to Linz and Rolandseck, each day costing 6*s.*, exclusive of hotel charges in Bonn. On Thursday, September 21, they will lead a five days' excursion, proceeding from Bonn to the Laacher lake, and spending the night at Niedermendig, proceeding next day to Gerolstein, the next to Manderscheid, the next to Bertrich, and on September 25 will reach Coblenz. Those who desire to do so may join Prof. Sievers' party, and proceed to Giessen on the 26th. The main excursion costs 70*s.*, the extension to Giessen 15*s.*

2. *To the Rhine, Taunus, and Lahn.*—Prof. Sievers of Giessen will meet the party at Homburg on September 21, and, after crossing the Taunus ridge, stop for the night at Feldberg. Next day a further study of the Taunus will terminate at Wiesbaden; the following two nights will be spent at Bingen, one at Coblenz, and

on the 26th the excursion will terminate at Giessen. There will be an average of about five hours' walking on each day, and the expense will be 75*s.*

3. *The Vosges.*—Professors Gerland and Weigand and Dr. Rudolph will conduct a circular tour from Strassburg through the Vosges from September 21 to 25. Nights will be spent at Wesserling, Gérardmer (on the French side), and Colmar, and a special feature will be the study of the lakes of the district. The estimated expense is 70*s.*

4. *Thuringia.*—Professors Walther and Regel will meet a party (limited to thirty-five) in Eisenach on September 23 for a short tour through Thuringia, spending one night each at Bad Liebenstein, Elgersburg, Saalfeld, and terminating in Jena on the 27th, in time for the night express to Berlin. The cost is 70*s.*

5. *Rügen.*—A party, limited to 150, will meet Professors Credner, Cohen, and Deecke in Greifswald on September 22, proceed next day to Sassnitz, on the island of Rügen, where three nights will be spent while the coasts of the island are examined, and on the 26th reach Stralsund, and go on to Berlin next forenoon. The expense is estimated at 55*s.*

6. *East and West Prussia.*—These extreme easterly provinces of the German empire will be visited under the guidance of Professors Jentzsch and Conwentz. The party will meet at Königsberg on September 21, where three nights will be spent while excursions are made to points of interest, including the Kurische Nehrung. One night will be spent at Elbing, and the last two days in Danzig, whence the lower Vistula will be visited. This excursion will deal largely with deltaic and glacial formations, and interest will be given to it by the search for amber and interglacial fossils. The cost will amount to £5.

7. A short one-day excursion will be made on Sunday, October 1, from Berlin, to see the glacial deposits at Rüdersdorf.

8. The final excursion starts from Hamburg after the Congress on October 7, for the special study of the glacial formations of the North German Plain, under the direction of Prof. Wahnschaffe and Drs. Keilhack and Müller. The stopping-places will be Lübeck, Stettin, and Stargard, where the excursion terminates on October 11. The cost will probably amount to 74*s.*

It is to be noted that the expense of the excursion is reckoned in each case from the place at which the party meets, and to the place at which it breaks up.

THE MONTHLY RECORD.

THE SOCIETY.

Geography at the Universities.—Mr. H. J. Mackinder, the Reader in Geography at Oxford, reports as follows: "My work at Oxford has been generally similar to that of previous years, but the attendance of students has been the largest since the readership was established. In the Michaelmas Term I lectured twice a week to 79 men from eighteen colleges, and to 16 ladies from three colleges. During the Hilary Term the numbers increased to 93 men from nineteen colleges, and 13 ladies from three colleges. In London I have lectured on the Teaching of Geography before the Association of Principals and Lecturers of Training Colleges, and at the Winter Meeting of Students, chiefly teachers,

held by the College of Preceptors. I have also lectured on geographical subjects at the London School of Economics. Much of my time during the past winter has been occupied with preparations for the more extended system of geographical teaching which, through the co-operation, now assured, of the Society and the University, is to be introduced at Oxford during the next academic year. Arrangements have been made to place at our disposal excellent rooms on the upper floor of the old Ashmolean Museum. Our chief difficulty in the earlier stages will relate to the adequate supply of apparatus and other material. We should be very grateful for help in this matter from any Fellow of the Society." Mr. Yule Oldham, the Reader at Cambridge, reports as follows: "The past academic year has been one of steady progress. My usual courses of lectures have been attended by larger classes. Of University extension lectures, I have delivered courses at Hull, Stepney, Market Drayton, and Wellington, which have been attended by audiences numbering over four hundred. In nearly every case the interest aroused has been such that the attendances have steadily increased throughout the course, resulting in strong requests for further series of lectures. With regard to the future, I have made arrangements for a considerable extension of my work here in the coming academic year, of which I trust to be able to report next summer a successful result."

EUROPE.

The Genesis of the Severn.—In a paper published in the April number of *Natural Science*, Mr. S. S. Buckman endeavours, on the lines laid down by Prof. W. M. Davis, to trace the various stages in the development of the river systems of Southern and Western England, which led to the growth of the Severn as an independent stream. The view that the present Severn and its branches originally formed part of the Thames system is not a new one, for Mr. Buckman remarks that some dozen years before Prof. Davis put forth his views on the subject, Dr. T. S. Ellis, of Gloucester, had imagined the possibility of rivers flowing across a non-existent Severn valley; Mr. Buckman, however, goes into greater detail than his predecessors, beginning from the supposed original system of dip-streams flowing south-east from Northern and Central Wales into the present Thames valley, and endeavouring to show the succession of changes which have resulted in the state of things now observable. As he himself allows, his statements are decidedly speculative, and only in a few cases are arguments brought forward in support of them, but the paper is suggestive, and will, it is to be hoped, lead to the accumulation of further evidence on the subject. Mr. Buckman considers that the Evenlode and the Kennet were formerly the most important branches of the Thames, but that the former was the larger and gained in importance by robbing the Kennet of some of its feeders. It is even supposed to have included within its basin portions of the modern Trent, Dove, and Mersey. In the second phase of the Thames system, before the encroachment by the Severn, the drainage had been collected, Mr. Buckman thinks, into five principal channels just east of the present Severn. These were captured one by one as the new stream draining to the south-west gradually worked its way back, while in their abandoned middle courses the present left-bank tributaries of the Severn were developed. The most important of these, as being the

earliest developed, we should expect to find opposite the Taff and the Rhymney. That this is not so, but that the longest is to be found further north in the Avon, Mr. Buckman explains by the fact that the original Usk valley, now occupied by the Avon, was the deeper, having received the larger drainage. The fact that many of the tributaries of the Avon flow more or less in opposition to its stream is instanced as an indication of the eastward flow of its predecessor.

Movement of Population in Northern Baden since 1852.—This subject is dealt with in an exhaustive way by Dr. Carl Uhlig in a recent issue of the *Forschungen zur deutschen Landes- und Volkskunde* (vol. xi. part 4). Before giving the results of his inquiries, the writer explains carefully the methods employed, which are such as to present the facts in as natural a grouping as possible. The region dealt with is not, Dr. Uhlig allows, a natural unit, or even a group of such; but in order to make it so it would be necessary to include portions of neighbouring provinces, and the labour of searching the records of four separate statistical departments would have been out of proportion to the results gained. Within Northern Baden, which he considers to end at the valley of the Kraichbach, Dr. Uhlig bases his study on the three natural divisions of the country, viz. the Rhine-plain, the Odenwald on its eastern flank, and the terrace-land of Swabia and Franconia. The ultimate subdivision is into parishes, but sometimes these are further divided, as, *e.g.*, when a single parish extends over a portion of the plain and also of the hills, as is often the case on the western margin of the Odenwald. This strip of country is therefore treated as a transition region, which Dr. Uhlig designates the Bergstrasse He also, in reckoning the density of population, places the forest area in a category by itself, as in Baden a large proportion belongs to the public domain, and the part of the population to which this gives employment is exceedingly small. A due proportion is, however, deducted from the population of the separate parishes where these include a class of people wholly or in part devoted to forestry. Deductions from area are also made in the case of barren lands, and in certain instances in that of water expanses, though both these categories are too small to be shown on the maps. Dr. Uhlig treats first of the changes in density of population which have taken place since 1852, and finds that an increase is principally to be noted in the west—in the Rhine plain and the adjoining hills—while a decided decrease occurs only in the mountainous parts of the two last main divisions. We thus have to do with a decrease in the uplands, less favourably situated from a climatic point of view, and an increase in the lower country, whose geographical and climatic position is more favourable, and which possesses important industries and trade facilities. The influence of movement from the country to the town is also apparent. In the latter part of the paper, Dr. Uhlig treats of the actual density in 1852 and 1895, and examines in detail the causes of change observable in each of the separate regions. He finds that almost every instance of increase is attributable to the great impetus which has been given to trade and industry of late years, this being particularly noticeable in the Rhine valley, and above all in the districts lying within the influence of Mannheim.

The Roman "Limes" in South Germany and the Fir Woods of Franconia.—A paper on this subject, by Dr. Robert Gradmann, appears in the third number of *Petermanns Mitteilungen* for the present year. In the first section of the paper the writer traces the course of the Roman "limes Germaniæ superioris" and "limes Rætiæ," the boundaries of the empire on the side of the independent Germans, as determined by recent investigations, and points out the difficulties which arise in the attempt to account for the line taken. From Miltenburg, on the Main, the German *limes* runs a little east of south to the vicinity of Lorch, in the Rems valley, whereas its continuation, the "limes Rætiæ," makes a sharp

angle with it near that place, running for a long distance considerably north of east. By cutting off the sharp angle made by the two lines, the Romans would not only have shortened the distance very considerably, but, by following various water-partings instead of cutting across the streams at right angles, would have encountered much less difficulties in the construction of the work. Dr. Gradmann dismisses such explanations as those which suppose the boundary determined by its parallelism with the courses of the Neckar and Danube; by the desire of the Romans to take their opponents on two flanks; and so on; but thinks an explanation may be found in the distribution of forests in the region in question. The western limit of the coniferous forests of Franconia, as laid down by Tscherning, coincides remarkably with the corresponding portion of the Roman *limes*; and though it is not so easy to draw a definite boundary in the Bavarian section, Dr. Gradmann's researches lead him to conclude that the same parallelism may be observed here. That the former limit of coniferous forests did not deviate to any great extent from the line assumed, is shown by the fact that place-names directly connected with conifers occur only to the north of that line, while they are particularly plentiful in its immediate neighbourhood. Dr. Gradmann carefully examines the causes for the parallelism thus ascertained, and comes to the conclusion that it is not due to the destruction of the forests by the Romans to the south of the *limes*, or to the encroachment of the forest from the north, but that the Romans found the distribution of forests much as it is at the present day, and constructed their frontier accordingly. That distribution seems really due to the composition of the soil, the beech thriving especially in soils composed of limestone and loam, while the fir and its allies flourish in the sandy and gravelly soils met with in the region of the *Keuper*. Dr. Gradmann examines the history of the settlement of Southern Germany, and shows how forest tracts, like that occupying the angle of the Roman *limes*, were long avoided, so that the hitherto problematical course of that line was really the only natural one.

ASIA.

Dr. Sven Hedin's Work in Central Asia.—We have received from Dr. Sven Hedin some details respecting the forthcoming publication of the scientific results of his former journeys in Central Asia, as well as an account of his plans for his new expedition. In addition to his own text, which will include an index and glossary of 3000 geographical names in East Turkestan, the work alluded to will contain memoirs on petrography by Dr. Bäckstrom; on the samples of sand collected, by Baron de Geer; algæ by Prof. Wille; phanerograms by Mr. Hemsley of Kew; and meteorology and hypsometry by Dr. Nils Ekholm. The topographical maps have been worked out with great care by Dr. B. Hassenstein, and will supply a large amount of new information respecting Eastern Turkestan. Dr. Sven Hedin hoped to start for Kashgar about June 27, and will attempt to reach that place by a new pass north of the Terek-davan. His first task will be the mapping of the Yarkand-daria, after the completion of which he proposes to proceed to Lob-nor, where he will spend the winter, carrying out levelling operations in order to test the possibility of past changes in the position of the lake. Another part of his programme is the study of the old river-courses of the Cherchen-daria and other streams of the Tarim basin, while in the summer of 1900 he proposes to turn his steps to Northern Tibet, paying special attention to its geology. He hopes to make his way to the important Gangri range, and to spend the winter at an elevation of over 16,000 feet in order to study the climate of Tibet at that season. In the spring of 1901 he hopes to return *viâ* India.

Ethnography of Turkestan and Tibet.—The second volume * of the important work presenting the results of M. Dutreuil de Rhins' unfortunate expedition to Central Asia has now appeared. The first, containing the narrative of the journey, has already been noticed in the *Journal*. The part now before us deals with the ethnography and sociology of Chinese Turkestan and Tibet, and in it M. Grenard, M. de Rhins' travelling companion, presents a useful summary of the manners and customs of the people of those countries, their occupations, family life, religion, commerce, and so on, with a degree of minuteness hardly before attempted. We cannot here enter into details on these subjects, but one or two chapters of the work which offer a more general interest may be briefly touched upon. One of these treats of the population of Chinese Turkestan from the point of view of its origin and affinities—a subject of much difficulty by reason of the very scanty information to be obtained from early writers on the country. While many travellers dwell on the heterogeneous character of the sedentary population of Turkestan, M. Grenard finds, in spite of many differences, a certain homogeneity which inclines him to consider the people as really forming an ethnical unit. For want of a comprehensive name, he is obliged to apply to them the common expression Turks, though this must not, he says, be taken as prejudging the question of their race, but merely as denoting that they speak a Turki language. He examines the accounts of the Greek,† Roman, and Chinese writers, and finds in the statements of the last named confirmation of the idea that the basis of the population, at least within historic times, has always been Aryan, an idea also borne out by the physical character of the people, especially the total absence of oblique eyes. M. Grenard is not the first to hold this opinion, for Shaw in his 'High Tartary' also lays stress on the Aryan type of the population. An interesting chapter is devoted to ancient and modern trade and trade routes, those in use in the time of the Han dynasty being clearly described. M. Grenard points out the strategic and commercial importance to China of a re-opening of the Lob-nor route, then a regularly frequented one. The concluding chapters of both sections of the book contain some thoughtful remarks on the present political situation in Turkestan and Tibet. In spite of the defects in the Chinese administration, the people of the former are not yet ready, M. Grenard thinks, to accept Russian sovereignty, though this will no doubt come in time. When no longer able to avert this contingency, Great Britain will, in his opinion, be forced to establish a protectorate over Tibet, where Chinese influence is almost *nil*, and will thus secure repose for India behind a colossal rampart of mountains, besides strengthening her position with regard to the Yang-tse valley.

Persian Trade-Routes.—A question of special importance at the present time —the opening up of Persia to foreign trade by the improvement of means of communication in the country—was dealt with in February last before the Society of Arts, by Mr. A. Hotz, whose paper is printed in the *Journal* of that Society for March 10. After remarking on the strange fact that an immense country on the high-road between the East and Europe is totally unprovided with efficient means of carriage either by land or water, the author gives a list of the trade-routes—mere mule-tracks—now existing, five being from the south and three from the north. Apart from some short roads near Teheran, the only cart-roads yet existing are (1) Teheran to Kasvin, 96 miles; (2) Teheran to Kum, 97 miles; (3) Meshed to Askabad, 160 miles, 30 of which are on Russian territory. Concessions for other

* 'Mission Scientifique dans la Haute Asie.' Deuxième Partiè. Paris: Leroux. 1898.

† M. Grenard goes into some detail to prove that the Sakas of the Greek and Roman writers did not inhabit Chinese Turkestan, unless the term is understood in a very general sense, similar to that attached to the term Scythians.

roads have been granted, but circumstances have in most cases hindered the carrying out of the projects. The most important of these was for a prolongation of the Teheran-Kum road to Ahwaz, on the Karun, which would have secured the shortest and least difficult route from the capital to the sea, and opened up the only well-watered province of Persia. The concession was obtained by the Imperial Bank of Persia, which established a service of diligences between Teheran and Kum, but, after executing a survey of the proposed road, was obliged by financial considerations to give up the undertaking. In the north, on the contrary, Russia, whose trade—principally in cottons and sugar—has of late years made great strides in that part of the empire, has persevered in the construction of a road from Kazvin to Resht and Pir-i-Bazaar, in spite of the difficulties encountered in crossing the Elburz ranges, and the work will certainly be completed by the autumn of the present year. On the opening of this route it should be possible to make the journey from London to Teheran within a fortnight, and this time would be further reduced by about four days when the Petrovsk-Baku line is opened. It will be impossible to utilize the line of the road for a railway, but the rapidly approaching Russian lines will, no doubt, in time be prolonged within Persian territory. Meanwhile a step forward in providing communications from the south has been taken by the arrangement entered into last year between a British firm and the Bakhtiari tribes for the opening of the much-discussed trade-route from Shuster to Isfahan through their country. The increased trade at Ahwaz and Shuster, which may result from the opening of this route, may lead to the resumption of the Ahwaz-Teheran project, which will always remain the ultimate aim.

The Eruption of Mayon in the Philippines, 1897.—In order to preserve a record of the principal phenomena connected with the destructive eruption of the great volcano of Mayon in 1897, Father José Coronas, S.J., has brought together, in a brochure published by the Manila Observatory, all the accounts of eye-witnesses which he has been able to collect. The volcano is situated in the south-east of the island of Luzon, in the north of the province of Albay, and is remarkable for its regular conical form, rising to a height of 8274 feet above the sea from relatively low surroundings; whilst, owing perhaps to the incoherent and fragmentary nature of the lavas of which it is composed, there is a complete absence of secondary cones on its flanks. Before describing the recent catastrophe, Father Coronas gives a brief review of all the previous recorded eruptions, paying especial attention to those which have occurred since 1884, the year in which the meteorologico-seismical service was established in the archipelago. The earliest recorded is that of 1616, mentioned by Spilbergen; but the most memorable, both on account of its magnitude and of its destructive effects, is that of 1814. That of 1881–82 was remarkable for its duration, but since 1814 no single eruption has equalled in importance that which forms the subject of the present publication. Several of the eruptions of Mayon have been preceded by earth-tremors, and this was also the case in 1897, considerable shocks with movements of oscillation and rotation, especially the former, having been experienced in the province of Albay on the night of May 13, the centre of action being situated in the island of Masbate, south of that province. Unusual signs of activity were first observed in the volcano on June 22, and these gradually increased until the 25th, on which date, especially after midday, it presented a terrible aspect, vomiting forth a dense column of smoke and ashes, which darkened a great part of the sky in the vicinity. An illustration is given, showing the appearance of the mountain at this time. The most violent period of the eruption lasted seventeen hours, during which an immense quantity of lavas and volcanic bombs were poured out. A map is given, showing the limits of the destructive action of the volcano, which was principally felt towards the east and

south-east, the lava-streams extending farther in these directions than in any other. Seven villages were wholly or in part destroyed by them, while much damage was also done in the town of Libog, at a horizontal distance of 6 miles from the summit. The late eruption was remarkable for the quantities of *lapilli*, ashes, and dust discharged, which fell over a large area of south-east Luzon, principally to the north-west of the volcano. The approximate limits of the fall of ashes are shown in a second map, the area affected measuring about 200 miles by over 100.

AFRICA.

Major Gibbons on the Zambezi.—Writing to us on March 10, Major Gibbons describes the course of his expedition down to that date. He was then, with the advance guard of his party, at Kazungula, at the Kwando confluence. During the ascent of the Zambezi great difficulties had been encountered, owing to the many rapids. The work of transporting the steamer and goods past those of Kebrabasa, a distance of 65 miles, was especially heavy, some parts of the route being as rough and hilly as Captain Gibbons had seen anywhere. In all, 537 porters were employed on the work. After the steamer had been put together at Chikoa, Captain Gibbons determined to proceed up the river with a load of four and a half tons (including passengers), and send back the steamer to assist the other two boats in the transport of the rest of the goods, it having been found impossible, owing to the strength of the current, to carry all in one journey. The work of bringing up the goods to the Kafukwe was entrusted to Mr. Muller, a man of indomitable energy, who, however, became prostrated with dysentery, so that the task devolved on Mr. Weller, who had brought back the steamer from the upper river. Owing to the delay thus occasioned, Captain Gibbons felt it necessary to abandon the idea of proceeding to the great lakes by the Kafukwe, more especially as the route, though interesting, would have led in great part over known ground. During his ascent of the Zambezi in the *Constance*, he had carefully mapped the river, which is incorrectly laid down on published maps, the rapids especially being very imperfectly shown. They proved much more numerous than had been anticipated, and, it being low-water, the channel was much blocked by rocks. The gorge a little above Zumbo, called Kariva by Livingstone, is also known, like that on the lower river, as Lupata; and as both names mean simply "gorge," and are already in use elsewhere, Captain Gibbons suggest the name "Livingstone gorge" for the one near Zumbo, which is one of the grandest and most picturesque pieces of scenery on the Zambezi. The name is not yet borne, he says, by any spot in Africa worthy of it. Navigation on the middle Zambezi ceases at the Molele rapids, about 20 miles below the Guay confluence. Above them a great number of rapids —some very severe—occur until 40 miles above the Victoria falls. After towing the steamer through nineteen rapids in little more than 20 miles, Captain Gibbons decided that any attempt to take it further was useless. Before turning it had passed through a most inhospitable gorge, almost devoid of life, and flanked by high sombre walls of rock, surmounted by huge blocks of basalt with high mountains beyond. It received the name of "the Devil's gorge." From the Sichiwene cataracts, which fall about 12 feet in two drops a few yards apart, Captain Gibbons proceeded to Sesheke, and thence by a new route to Lialui, where he made arrangements with Lewanika for the future course of the expedition. He hoped, in conjunction with Captains Quick and Hamilton, to do some exploration westwards, on the Kwando, Okavango, and Kwito, and then to ascend the Zambezi to its source. We have received Captain Gibbons's map of the middle Zambezi, which promises to supply valuable additions to our knowledge.

Mr. Mackinder's Expedition to Mount Kenya.—Mr. H. J. Mackinder

has lately started on an expedition to Mount Kenya, with a view to a thorough scientific examination of the mountain and its vicinity. He is accompanied by Mr. Hausburg, who is defraying a considerable part of the expenses of the expedition, as well as by two Swiss guides and two natural history collectors. A sum of money has been placed by our Society at Mr. Mackinder's disposal, and we look forward to good results from the exceptional facilities for research which he will enjoy. He proposes to camp at an elevation of 16,000 feet, and, if possible, to ascend to the summit, which has not yet been reached, though an altitude of 17,000 feet was attained by Dr. Gregory from the west, while the foot of the final peak was reached by Dr. Kolb from the east.

German Scientific Researches on Lake Nyasa.—We learn from the *Verhandlungen* of the Berlin Society, that the Prussian Academy of Sciences has set aside a sum of money for the thorough botanical and zoological investigation of the neighbourhood of Lake Nyasa. The expedition will be under the leadership of Dr. Fülleborn, who has already resided as doctor at Langenburg, and he will be joined, as botanist, by Dr. Goetz, who will proceed to the lake overland from Dar-es-Salaam, taking with him the necessary scientific equipment.

AMERICA.

M. Romero's Work on Mexico.—Mr. M. Romero's work on 'Coffee and Indiarubber Culture in Mexico,' * a copy of which has recently been presented to the library, is of importance both geographically and commercially. The first 280 pages, forming the greater part of the volume, are occupied by "Geographical and Statistical Notes on Mexico"—also published as a separate volume—and constitute a compendium of facts on the geography and statistics of the country. Part I. of these "Notes"—Geography—embraces information on a variety of aspects of the subject, including location, boundaries, and area; geology; mining; orography; hydrography; climate; flora; cattle-raising; fruits; irrigation; fauna; ethnology; languages; population; education; the city of Mexico, its climate and meteorology, etc. Mexico, possessing such diversity of climate, is capable of raising most of the agricultural products of the world. The mean temperature in the hot region varies from 77° to 82° Fahr., seldom falling below 60°, but often rising to 100°, and in the sultry districts of Veracruz and Acapulco occasionally to 104°. The temperate zone, described as one of the finest climates of the world, is located from 3000 to 5000 feet above the level of the sea, and embraces all the higher terraces, and portions of the central plateaus themselves. The mean temperature is from 62° to 70° Fahr., varying not more than 4° to 5° during the season. The cold region is located from 7000 feet above the sea-level upwards, and has a mean temperature of from 59° to 63° Fahr. Most of the grand central plateau is located in this region. The rainfall is about one-fifth that in the temperate zone. The most thickly inhabited portion of the country lies in the central plateau, and is high above the level of the sea. It is pointed out that the climatic conditions of Mexico are undergoing great changes on account of the destruction of the forests. Owing to the difficulty of transporting coal, the population has had to depend upon charcoal for fuel, which has in the course of time denuded the mountains, thus changing the climatic conditions of some parts of the country. The Indian population has been decreasing since the beginning of the century. According to the last census,

* 'Coffee and Indiarubber Culture in Mexico. Preceded by Geographical and Statistical Notes on Mexico.' By Matias Romero. New York and London: G. P. Putnam's Sons. 1898.

that of 1895, the population of Mexico was 12,570,195. Among the more important matters dealt with in the statistical portion of the work may be mentioned railways. The mileage of railways and tramways in Mexico in 1895 is given as 7,388,158, presumably 7388·158, although it is somewhat unusual to measure railways to the thousandth of a mile. Not the least important part of the work is the section dealing with the drainage of the valley of Mexico. This important undertaking is now practically finished. The sewage of the city of Mexico, which has hitherto been discharged into Lake Texcoco—a lake with no outlet and liable to floods—will now, together with the surplus waters, be carried by means of a canal 43 miles in length, and a 6-mile tunnel through the mountain range, to a river, and so to the Gulf of Mexico. The completed system is stated to have cost $20,000,000. The author's experiments in coffee and indiarubber raising were made some years back in the district of Soconusco, in the state of Chiapis, in South-Eastern Mexico. In his manual on the subject, forming the latter portion of the volume, he discusses fully the various aspects of the subject of coffee and indiarubber cultivation, especially with regard to Mexico. The district of Soconusco seems, both as regards soil and climate, to be admirably adapted to the cultivation of coffee, but at the time of writing (1874), the scarcity of labour here was the principal drawback. The author is of opinion that coffee-growing will continue to be one of the most lucrative branches of agriculture in Mexico. With regard to the cultivation of indiarubber, the author speaks from experience, and sets forth the advantages of Soconusco, where he had a fair-sized plantation. Lowlying land, where the climate is hot and damp, is best suited for this cultivation. He takes a very favourable view of the future results of rubber culture in Mexico.

Dr. Sapper on the Physical Geography of Central America.—Dr. Karl Sapper, whose previous contributions to our knowledge of the geography of Central America are well known, has brought together, in a supplementary number of *Petermanns Mitteilungen* (127), the bulk of the material collected by him down to 1897, during his journeys in Southern Mexico, Guatemala, Honduras, and Salvador. He thus presents a systematic sketch of the geology, orography, and hydrography of the whole of Northern Central America, down to the isthmus between the Gulf of Honduras and Fonseca bay. The first section of the brochure records in detail the geological facts collected, chiefly in the form of descriptions of profiles along the various routes followed by Dr. Sapper in his extensive wanderings; the profiles themselves being reproduced at the end of the paper. No attempt is here made at generalization, this section being intended merely to supply students with a basis on which to found their own conclusions. In the second section an attempt is made to present a more comprehensive view of the structure of the country, though, as Dr. Sapper remarks, our knowledge is not yet extensive enough to allow a complete picture of the geological history to be drawn. Having first described the distribution in Central America of the different geological formations, from the archaic rocks, which, in continuation of those of the Western Sierre Madre, form, especially in Guatemala, the groundwork of the whole, to the recent alluvial and other deposits, Dr. Sapper passes to the consideration of the general structure of the country. This appears to be unusually complicated, the mountainous country being traversed by an extraordinary number of breaks and faults, whilst in the south the eruptive masses have covered all but a small fraction of the original formations. The general structure of the country is asymmetrical, for Palæozoic rocks are entirely wanting south of the archaic zone in Guatemala and Honduras, and an extraordinary diversity of geological history is also observable in detail. Our topographical knowledge is likewise insufficient to allow the present surface features to be explained fully on tectonic grounds, still the general character of

separate districts can be referred to distinct types. Thus Yucatan and the adjoining portions of Guatemala and British Honduras are plateau-lands where folding and fracture have played a comparatively small part. The mountains of North and Central Chiapas are composed of table-like masses, in which the strata are sometimes thrown up at a steep angle. The Palæozoic and archaic formations take the form of folded ranges, and so on. A section is devoted by Dr. Sapper to the hydrography in its relation to geological structure, while remarks on the soils represented and copious tables of altitudes complete the paper. There are two large-scale (1 : 1,100,000) maps of Northern Central America, one showing contours of altitude in ten gradations of colour, the other the distribution of the various geological formations.

Further News of Dr. Steffen's Expedition.—In our last number we recorded the discovery by Dr. Steffen of three large rivers debouching into Baker channel on the west coast of Patagonia, and stated that it was the intention of that traveller to attempt to penetrate the Cordillera by the most important of the three the Rio Baker. From a note published in *Globus* (vol. 75, p. 344) it appears that Dr. Steffen has succeeded in the attempt, having made his way to Lake Cochrane before the end of February. The Rio Baker was ascended for some 45 miles, when a fall was encountered, which put a stop to navigation by the boats. Continuing his journey on foot, and occasionally making use of the canvas boats, Dr. Steffen left the main stream and ascended a tributary, which proved to issue from a lake. The main stream comes from the north, but the tributary from the north-east. The deep valley of the latter contains a number of small lakes, and finally Lake Cochrane, which is long and narrow and somewhat curved. The Rio Baker is one of the largest streams of Chili, and has possibly the greatest volume. The Lago Buenos Aires seems to belong to its system. Deer were met with in large numbers, and, having apparently never seen a human being before, were easily shot. The weather had been fine throughout, the district being evidently much drier than Chiloe and Valdivia. The vegetation is less luxuriant, and at Lake Cochrane many Chilian trees appear merely as brushwood.

AUSTRALASIA AND OCEANIC ISLANDS.

The Jesup North Pacific Expedition.—An outline of the field-work of the Jesup North Pacific Expedition during 1898 is given in recent issues of *Science*. On both the Asiatic and American continents ethnological, as well as archæological, work has been done. Ethnological investigations were conducted by Mr. R. B. Dixon in a little-known district on the west coast of Washington, extending from Cape Flattery to Grey's Harbour, about 100 miles in length, and inhabited only at a few points. The Indians of the coast to the south of Cape Flattery consist of two tribes—the Quilleute and the Quinault. The linguistic material collected shows the Quilleutes to be of Chemakum origin, while the Quinaults are of the Salish stock which occupies most of the territory about Puget sound. The archæological work in British Columbia carried on by Mr. Harlan I. Smith during the past two years has mainly been directed to—(1) an examination of the archæology of the southern interior of British Columbia; and (2) an investigation of the shell-heaps of the coast of Vancouver island, together with those of the adjacent mainland. Investigations on the Indians of the southern interior of British Columbia were continued by Mr. James Teit. The ethnological work on the Amur river, more particularly among the Gilyak, was carried on by Dr. Berthold Laufer, his investigations in the island of Sakhalin being of special interest. Several months were spent among the various tribes inhabiting the island, and a number of ethnographical objects were collected. Mr. Gerard Fowke has also devoted his attention

to the archæology of the Amur region. An investigation was made along the river for 850 miles above its mouth, and of the coast along the channel of Tartary as far as Okhotsk sea. No evidence was found to indicate a former population different from the present.

Cession of the Carolines to Germany.—By the recent purchase of the Caroline and Marianne archipelagoes by Germany, one of the last remnants of Spain's once imposing colonial empire has passed away from her hands. The groups, as is well known, consist only of small islands, but they are of some strategical importance to Germany by reason of their proximity to the other German possessions in the Western Pacific. For a description and map of the group, as well as special maps of the most important islands, we may refer our readers to the paper by Mr. Christian, published in the February number of the *Journal*. The island of Guam remains in the possession of the United States. It has also been rumoured that negotiations are on foot for the purchase of Fernando Po, in the Gulf of Guinea, by Germany, and of the Canary islands by the Congo State.

Dr. Lauterbach's New Expedition.—It is announced in *Globus* that Dr. Lauterbach, well known as the discoverer of the great Ramu river in German New Guinea, the identity of which with the Ottilien has since been proved by Lieut. Tappenbeck, is about to resume his explorations. He hopes to explore not only the upper Ramu, but the Great Bismarck range which bounds its valley to the south, and has for this object secured the services of two Australian prospectors.

POLAR REGIONS.

The Swedish Expedition to East Greenland.—This expedition, under direction of Dr. Nathorst, in search of Andrée and his companions, left Stockholm on board the *Antarctic* on May 20, and Helsingborg, where further provisions, coal, and equipment were taken on board, on the 25th. It was the intention of Prof. Nathorst to use the sails as much as possible, in order that the campaign through the ice might be begun with a plentiful store of coal. He intends to do some hydrographical work north-east of Shetland and in the "Norwegian Deep," and it is on this account that the expedition has left Sweden so early. The *Antarctic* is under command of Captain N. Forsblad, of the Swedish merchant service, who was first mate during the expedition to Spitsbergen and King Charles Land last year, while the then second mate, Captain H. J. Haslum, a Norwegian, who makes his twenty-fifth journey to the north polar region, has advanced to first mate. The second mate, Captain J. Menander, as well as the chief engineer, Mr. T. Peterson, and several of the crew, were also members of the expedition last year. The scientific staff is not quite so numerous as last year, partly in consequence of some cabins having been left empty for Andrée and his companions, if found, partly because the stay on land will be relatively short. Besides Prof. Nathorst, who undertakes the geological work, the scientific members are the following: Mr. Elis Nilson, zoologist (vertebrates), forest-officer, who made the journey to Baffin bay on the steamer *Eclipse* of Dundee in 1894, in search of the unfortunate Björling and Kallstenius; Mr. P. Dusén, C.E., explorer of Cameroon and Tierra del Fuego, botanist and cartographer; Dr. T. Arwidsson, zoologist (vertebrates); and Dr. J. Hammar, surgeon. There is little hope that the coast of Greenland can be reached before the latter part of July, and the passage through the ice will therefore not be begun before the end of June or beginning of July. Prof. Nathorst thinks that he will make this passage between 74° and 76°, and that he will reach the coast at Shannon island. As soon as he has reached the coast, expeditions will be made to north and south. If Andrée has reached the coast, he will probably have raised some signal with information where he has gone. As to the work at the coast, this will

depend on circumstances, and it is unnecessary to give further particulars here. Prof. Nathorst hopes to be back in the latter part of September, but if the vessel should be caught in the ice, he has provisions for a year, so that he is prepared for wintering, although he hopes that it will not be necessary.

Expedition of the Duke of the Abruzzi.—The Duke of the Abruzzi, whose plans for an attempt to reach the north pole have already been described in the *Journal*, sailed from Christiania on June 12, in the *Stella Polare*, for the arctic regions.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Pole of the Land-hemisphere.—A further contribution to this subject is made in the third number of the *Geographische Zeitschrift* by Prof. Penck, who, in discussing the results arrived at by H. Beythien (cf. *Journal*, vol. xiii. p. 543), shows that considerable modifications are introduced if we take account of the ellipsoidal form of the Earth. Krümmel's method is based on the idea of a perfect sphere, and he thus supposed that if we have a hemisphere with a pole in lat. 47° 15′ N., the angle made by the corresponding equator with the plane of the Earth's equator would be 90° − 47° 15′, or 42° 45′. With an ellipsoid of rotation, however, this is not the case. The radius of a point in 47° 15′ N., makes with the Earth's equator an angle equal to the geocentric latitude, which in 47° is $\frac{1}{5}$° less than the geographic latitude. The angle between the respective equatorial planes is therefore $\frac{1}{5}$° greater than was supposed. Conversely, if we find this angle to be 42° 45′, the pole of the land-hemisphere will not be in 47° 15′, but in 47° 27′. Taking account of this fact, it is found (1) that the pole corresponding with Beythien's equator must be moved more than 12 miles to the north; and (2) that the equator of the land-hemisphere must be represented on Beythien's map, not by a straight line, but by one slightly curved, diverging northwards from his line in accord with the differences, in the respective latitudes, between geographic and geocentric latitude. The total loss of land-area in Asia will thus amount to 43,000 square kilometres, and the nett loss for the whole hemisphere to 3000 square kilometres. Making similar corrections for the lines corresponding with Beythien's other poles, we find that his No. 5 (in 47° N. and 1$\frac{1}{3}$° W.) is the most favourably placed, and, with the proper correction for the difference between geographic and geocentric latitude, this lies in 47$\frac{1}{2}$° N., and just east of Nantes. Another result is that the differences in the merit of the several poles are lessened, not exceeding the extent of probable error; while a second district, in the department Ariège, is found to be particularly favourable for the choice of a pole, possibly more so than that around Nantes. The choice of one or other locality practically depends in the inclusion or otherwise of Japan within the land-hemisphere; and, whatever the final verdict, the fact is clearly brought out that the land-masses are not grouped round a single centre.

GENERAL.

Honour to Henry M. Stanley.—We record with pleasure the honour lately conferred by Her Majesty on Henry M. Stanley, whose selection for the distinction of Knight Grand Cross of the Bath is a well-deserved recognition of his great services to the cause of African geography.

OBITUARY.

Mr. C. H. Coote.

THE death of Mr. Coote, of the Map Department in the British Museum, is a great loss to geographical learning in this country. Few men, either in England or on the Continent, have had a more thorough acquaintance with sixteenth, seventeenth, and eighteenth century cartography. Mr. Coote's knowledge of mediæval maps was also very extensive. He had a keen interest in the difficult and controverted points which naturally arise in the study of historical cartography, as in other branches of science, and he followed an intricate argument with close attention and a rapid perception of its weaker and stronger points. Thus any one acquainted with the subject-matter would have been impressed by his remarks on the chief writings in the Cabot controversy, and by his criticism of the cartographical oversights and misstatements which have injured some of the most careful and elaborate studies in this field.

It is much to be regretted that Mr. Coote did not complete any work which would have made him as great a public authority (in some branch or period of historical geography) as he was a private referee for other students; but this was not his fault. In his position, bound as he was to be at the service of every visitor to the Map-room, it was not possible for him to do much more than the work of his department. And this was doubtless satisfactory to the authorities of the Museum; but the consequence, in the present case, has been that various essays, papers, booklets, and reviews, which might have been co-ordinated into some standard treatise, to be consulted and valued by generations of geographical workers, have remained in the stage of valuable fragments; and so we have nothing from R. H. Major's old colleague and true successor which can be put alongside of the former's 'Life of Henry the Navigator.' An exhaustive and (for the English reader) final study of early Dutch cartography Mr. Coote's friends might have expected to see from his pen, if he had ever been able to devote himself to research work. From such a flight, suspicious and repellant to the official mind, the National Library was careful to restrain him; and, in consequence, one must be content with saying that Mr. Coote's writings are very inadequate representations of his wide learning, even if they give a fair picture of his painstaking and minute scholarship. We must be thankful for his editions of the 'Harleian' and other Dieppese mappemondes of 1536–50 ('Bibliotheca Lindesiana;' 'Collections and Notes,' No. IV.; 'Facsimiles of Three Mappemondes, 1898'); of various important examples of seventeenth-century Dutch cartography in the series of 'Remarkable Maps' (Parts I., II.), published by Frederick Müller, of Amsterdam; of the much disputed 'Voyage of Vespucci to India' in 1505–6 (B. F. Stevens, 1894); of Shakespeare's 'New Map, with the Augmentation of the Indies,' referred to in *Twelfth Night* (Hakluyt Soc., vol. lxxii., 1886). We must also not forget his co-operation with Mr. Delmar Morgan in a joint edition of 'Early Voyages and Travels in Russia and Persia,' by Anthony Jenkinson and others (Hakluyt Soc., 1886); or the great assistance he rendered to the late Mr. Major in so many of his books. His life of Sebastian Cabot in the 'Dictionary of National Biography' is able and scholarly; and though it may be regretted that Mr. Coote sanctioned the 'Bristol' theory of Sebastian's birthplace, it is far more unfortunate that the writer of that article never had the opportunity to deal with the whole Cabot controversy in a set treatise, comparable to those of M. Harrisse. The present writer well

remembers how keen and how minute an interest he took in that fascinating subject; few, if any, were better acquainted with it on the cartographical side; and his suggestions were of great service in the preparation of the volume on John and Sebastian Cabot for the series of 'Builders of Great Britain.' Yet how small are these items in comparison of what might have been said if Mr. Coote had enjoyed the comparative freedom of some other men for original work.

Obituary of the Year.

The following is a list of the Fellows who have died during the year 1898–99 (May 30)—

Sir T. Dyke Acland; W. J. Anderson; David Aitchison; G. H. Andrews; General R. D. Ardagh; K. E. Brodribb; William Brown; Major Bridgford; Rev. T. E. Brown; Captain J. F. Browne; Sir Henry Barkly; E. W. Berryman; R. H. Blades; Sir G. Baden Powell; John Barrow; Charles Bonney; Baron John Bentinck; Sir George Bowen; W. Bickford Smith; Major D'Arcy Baker; D. J. Caddy; Rev. Tupper Carey; C. J. Cassiani; Don Louis Carranza; Don Francisco Coello; John E. Chanler; Colonel Alexander Cook; John M. Cook; W. M. Crocker; W. H. Davies; Major G. de Winton; T. H. Davis; Robert E. Davies; Captain F. G. Dundas; General Sir W. K. Elles; C. Washington Eves; John Forster; Sir W. A. Fraser; Colonel J. B. Findlay; Sir John Fowler; Major-Gen. G. McB. Farquharson; Sir Clare Ford; J. C. W. P. Graham; Sir George Grey; General W. H. Goodenough; Sir Douglas Galton; Dr. C. Herz; Charles Harrison; V. W. C. Hamlyn; Charles Hoare; Hon. H. G. L. Howard; W. H. Halliday; W. H. Heaton; Wm. Alfred Harrison; B. A. Hankey; Chevalier F. Jeppe; Wm. Morris James; F. P. Keysell; D. M. Kisch; David Kay; Captain Kirkpatrick; Commander Keane; Prof. Kiepert; H. N. Lay; Rev. D. Grenville Lewis; G. R. le Pays; Sir C. C. Lees; Sir E. Lugard; Earl of Lathom; A. F. Low; J. C. Leaver; Don Ramon Lista; Thomas Martin; Colonel E. Molyneux; H. B. Marshall; Colonel W. C. F. Molyneux; Alfred Morrison; Arthur Mills; Captain J. P. Mayo; Admiral Thomas Miller; Captain Philip Montagu; Wm. Lord Newton; Duke of Northumberland; H. M. Ormerod; Admiral Pike; Colonel W. Pinney; Sir Henry Peek; Chevalier Max. Proskowetz; Hon. R. Pharazyn; J. H. Paul; John Pickering; Sir Lambert Playfair; W. H. Rinder; Major John Ramsay; E. Rawson-Walker; C. D. Radcliffe; Lieut. W. J. L. Roe; Baron de Reuter; Henry Rose; Duke of St. Albans; J. L. Clifford Smith; Osbert Salvin; Henry Smiles; Captain J. R. B. Serjeant; Don S. Salas; G. E. T. Smithson; George Sutherland; Robert Tait; James Wales; Colonel R. G. Woodthorpe; Right Hon. S. Walpole; Lieut.-Colonel H. L. Wells; O. C. Waterfield; J. S. Webb; J. H. Watson; George Wedd; Mr. Justin Winsor; W. F. Webb.

CORRESPONDENCE.

The Canadian Rockies.

Since my paper on "Exploration in the Canadian Rocky Mountains" appeared in the April number of the *Journal*, my attention has been drawn, by Dr. George M. Dawson, head of the Geological Survey of Canada, to a passage in my paper that certainly needs correction. The statement is as follows: "Most of our knowledge, therefore, at the present time, of that part of the mountains which lies 100 miles to

the north or to the south of the railway at Laggan is either knowledge gained in the early part of the century by traders in the employ of the fur-trading companies, or from Palliser's 'Journals,' or Wilcox's book on Mount Assiniboine and the surrounding country."

Dr. Dawson has kindly sent me a report of the Geological Survey of Canada for 1886, in it can be found, not only descriptions of a great deal of the mountain country south of Laggan, but also a large reconnaissance map of the country, geologically coloured by Dr. Dawson, as far south as the South Kootanie pass.

This report of Dr. Dawson's contains a most interesting description of that portion of the Rocky mountains extending from the international boundary northward to the headwaters of the Red Deer river; moreover, it includes a history of all previous exploration, and no less than nine passes across the great divide were explored. In 1886 a detailed examination of the Bow river pass and vicinity was also made by Mr. R. G. McConnell. Dr. Dawson has also sent me the preliminary report for 1898, in which Mr. J. McEvoy, of the Canadian Geological Survey, during his exploration last summer in the mountains near the Yellow Head pass, discovered an exceptionally grand mountain (Robson peak), near the headwaters of the Fraser river. By trigonometric measurements he finds this peak to be 13,500 feet high. It is therefore the highest known peak of the Canadian Rocky mountains that has been accurately measured, although I believe that Columbia peak at the headwaters of the Athabasca will prove to be nearer 14,000 feet when its height is properly determined. And this statement is not the result of mere guessing, for we climbed peaks 11,900, 11,600, 11,400 feet (height measured by mercurial barometer) within a few miles of Mount Columbia, and were, therefore, well able to judge its height within a few hundred feet. Moreover, those peaks that we discovered last autumn, Mounts Bryce, Columbia, and Alberta, are grouped round glaciers that feed three of the largest rivers in Canada, and therefore probably constitute the culminating point of the Canadian Rocky mountain system.

J. NORMAN COLLIE.

Rhodesian Art.

Dr. Henry Schlichter's most interesting paper on "Travels and Researches in Rhodesia," which appeared in the April *Journal*, has thrown light upon some of my South-East African curios. While packing for my homeward voyage last year, a friend handed to me a carved bamboo snuff-box about 2½ feet long. "Here you are," he said; "take that home and show your friends what the native of this country is able to do in his raw state." He is a merchant who believes in the native. The snuff-box had to me simply the ordinary interest, until I unpacked my curios at a missionary exhibition after reading Dr. Schlichter's paper; then the mystery of the carving was solved, and at once it flashed upon me that the native who carved the bamboo snuff-box had been influenced by the ancient Semitic people who three thousand years ago colonized South-East Africa. Evidently he had copied the wall decorations of the Mombo ruins, and the ornaments on the terrace of the ruins. Beautifully and correctly carved are the chess patterns, the Zimbabye pattern, double herring-bone, and pointed cone.

WM. COPELAND.

Buttermere Vicarage, June 6, 1899.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1898–99.

Eleventh Ordinary Meeting, May 29, 1899.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Alfred Adam; Henry Coates; Robert Furrest; William Coutts Fyfe; Charles Phillips Sanders; Henry Cathcart A. Young.*

The Paper read was :—

"Explorations in Patagonia and the Eastern Andes." By Dr. Francisco Moreno.

Anniversary Meeting, June 5, 1899.—Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

THE Secretary read the Minutes of the last Anniversary Meeting.

ELECTIONS.—*W. Freke Evans; William Foster; A. J. Grant; Richard N. Hall; Captain Bernard Ramsden James; Lucien Joseph Jerome; Frank Mills; William Duerdin Perrott; P. Lee Phillips; Robert de Rustafjaell; H. R. Wallis.*

The Presentation of the awards for the year then took place.

The PRESIDENT, addressing the French military Attaché, said: In the name of the Royal Geographical Society we have to thank you for your kindness in coming here on this occasion, to receive the medals of your compatriots, who are unavoidably absent. Captain Binger has explored the bend of the Niger in the extensive region hitherto unknown, or only partially known. He has devoted to that work his rare gifts of intrepidity, resolution, perseverance, and his great scientific attainments, and the result has been a work which will be the authority on the subject of the region of the bend of the Niger hereafter.

M. Foureau has for the last twelve years been leading expeditions into the wild deserts of the Sahara; he also has devoted great energy to this work, which is one of extraordinary difficulty and hardship, and his scientific results have been most valuable, he having astronomically fixed a great number of points in a previously unknown region.

Your two illustrious compatriots have thus, by their great geographical achievements, won for themselves a place in the forefront of the glorious roll of African travellers. I cannot help saying on this occasion that, whatever may have been the rivalries between our two countries, the geographers of Britain and France have never had any feeling of the kind since the days of Bourgainville; they have only felt generous emulation in furthering the common work of geographical science. I think I should mention to you that the two medals are given by Her Majesty, and that the Council of this Society is entrusted with the very responsible duty of assigning them; and I would add, also, that the medals are exactly of the same value—I don't mean only intrinsically, but as regards their honorary value. I now have the great pleasure of placing in your hands, for transmission to the recipients, the Founders' Gold Medal for Captain Binger, and the Patron's Gold Medal for M. Foureau.

Colonel Count DU PONTAVICE DE HEUSSEY, French military Attaché: In the name of my fellow-countrymen, M. Binger and M. Foureau, I tender grateful thanks for the great honour bestowed on them this day by the Royal Geographical Society, and for the gold medals which I have received for them. I thank the Royal Geographical Society, not in their name only, but in the name of my

Government and of my country, for this splendid recognition of the labours of my two compatriots.

I believe this is the first occasion on which two gold medals have been conferred on Frenchmen at the same time, and, indeed, I understand that only in two previous instances—that of Francis Garnier and that of Mr. Élisée Reclus, the celebrated geographer—has such an honour been conferred at all. This fact invests the present gathering with a special pride and interest for all Frenchmen. Captain Binger, who now holds a high official position in our colonial administration, had ardently desired to be present here himself, and to receive the medal conferred upon him from the hands of your distinguished Chairman; but his official duties prevent him from leaving Paris, and he has begged me to express his deep regret and also the pride and satisfaction he feels at having been selected to receive this honour—a pride and satisfaction which are increased by the conviction that in doing him honour you desire to honour the work done by French explorers generally towards the civilization of the continent of Africa.

These feelings, believe me, are shared in every particular by Monsieur Foureau. He is far away, still labouring hard, and no doubt preparing fresh scientific results to be added to those already attained, and which will, I trust, give further proof that the men you have chosen to honour are worthy of your choice.

Before I sit down I should like, as a Frenchman and a soldier, to express my heartfelt thanks to all this assembly for the warm and friendly reception given to the successes won by my distinguished fellow-countrymen. I shall not fail to let them know all the details of this meeting, and the memory of it will be a precious one to them. Neither will it be forgotten in the country they love and serve.

This honour bestowed on two sons of France, as a reward for labour which has called, not only for scientific knowledge, but frequently for great personal heroism, will be all the more valued because it is given in a year full of special feeling to the loyal subjects of Queen Victoria, and, let me add, such ceremonies, such recognition of noble endeavour, as these at which we assist this afternoon must surely draw our two countries, which both of them know how to produce and how to value heroes, into closer and more intimate bounds of friendship and mutual appreciation.

The President: The Murchison Grant has been awarded to Mr. Albert Armitage, of the Jackson-Harmsworth expedition. In giving the reasons for this award, I cannot do better than quote the words of Mr. Jackson himself. He says, "To the energy and industry of Mr. Armitage is due the carefully recorded meteorological, astronomical, and magnetic observations, extending over three years. To Mr. Armstrong's loyal aid I wish to offer my testimony. We have been through rough times in many dangers and hardships together, and I know the good material of which he is made." It is particularly agreeable to me to have to present this award, because of the deep interest I have always taken in the *Worcester*, where Mr. Armitage was educated. I am glad to say we have here present the late captain of the *Worcester*, Captain Henderson Smith, and the present captain of the *Worcester*, Captain Wilson Barker, and I believe one or two former cadets of the *Worcester*, and after his own family I am sure none will rejoice more at this recognition than the cadets of the *Worcester*. Many of them will wish to emulate the deeds of their old schoolfellow.

Mr. Carnegie, the Gill Memorial has been awarded to you for your very remarkable journey in Western Australia, both from south to north, and again from north to south; for the admirable way in which you have conducted your expedition; and for the route survey, combined with astronomical observations, by which you laid down your routes. On that occasion it is interesting to remark that you

actually twice crossed the route of three of our Gold Medallists, Forrest, Warburton, and Giles. I now have great pleasure in placing in your hands the gold watch which you have selected for your award.

Captain Sykes has received the Back Grant for his important journeys in Persia, during which he corrected many errors in the former maps of Persia, and acquired useful geographical information. It has been his great merit to study the ancient history of the country, following in the footsteps of Sir Henry Yule, and he has discussed interesting points connected with the geography of Marco Polo and the earlier Persian geographers.

Hon. DAVID CARNEGIE: I don't know that this meeting calls for any long speeches. It only remains for me to apologize for the slight service I have been able to do. I am sorry I have not been able to bring back more results, but that is more the fault of the country than of me. I assure you that when I was in the middle of Australia, the last thing I thought of was that I should find myself standing here with a high collar on to return thanks, and I feel very much gratified to find my services acknowledged, and my present ambition is to find myself standing here again at some future occasion.

The PRESIDENT then delivered his Annual Address (see p. 1), after which he said: We have been requested by our sister Society in New York to offer the facilities of our anniversary meeting to His Excellency the American Ambassador, for the purpose of presenting the medal of the Geographical Society of New York to our respected colleague Sir John Murray. It is with very great pleasure that we have acceded to this request, for our intercourse with the American Geographical Society has always been most friendly. I am proud to say that its venerable President has been my friend for upwards of a quarter of a century. I will now ask His Excellency to present the medal.

His Excellency the American Ambassador, Mr. CHOATE: I ought to apologize for having come here late to perform this pleasing duty, as it should have been done at the presentation of the other medals by your own Society, but when I tell you that I had a previous engagement to be present at the gathering of the Master and Brethren of the Trinity House—at which the Prince of Wales was present as the Elder Brother of the House—I am sure you will excuse my temporary absence. His Royal Highness was graciously pleased, when I told him of the pleasant duty I had to do here this afternoon, to wish me God-speed and bid me take French leave.

I appear here as the representative of the American Geographical Society of New York, and with the concurrence, I may say, of the Secretary of State of the United States, who expressed, on behalf of the Government of that country, full sympathy with the objects which the New York Society had in view. I appear here as the bearer of its Gold Medal to present to one of your most distinguished scientific men. The American Society is one of those associations for similar purposes as your own, formed many years ago in emulation of the noble example which this Society has set to the world. Undoubtedly it has achieved great successes on its own part; it has been the patron of many illustrious expeditions which have extended the world's geographical knowledge, and it has acted no small part in advancing the science of geography, to which you are all so ardently devoted; and as the spirit of science knows no geographical boundaries, it is in entire sympathy with efforts in the same direction the world around, and so, in assigning its really beautiful Gold Medal, the American Society has not confined itself to the citizens of its own country, but has looked the world over for the worthiest to be its recipient. It is not for me to state in this presence what Sir John Murray has done to entitle him to such recognition on the part of our distant Society; you

know far better than I do the great works which he has accomplished. I think it is all summed up on the front of this medal, and in lieu of a longer speech you will perhaps allow me to state what appears on its face—

"THE CULLUM GEOGRAPHICAL MEDAL, AWARDED TO SIR JOHN MURRAY, K.C.B., NATURALIST, DEEP-SEA EXPLORER, OCEANOGRAPHER, EDITOR 'CHALLENGER REPORTS.' 1899."

And on the reverse—

"THE AMERICAN GEOGRAPHICAL SOCIETY, NEW YORK,"

with a relief of the ideal explorer, an ideal scientist, standing in the bow of his boat as it approaches what seems to me to be the antarctic continent, shading his eyes from the glare of the polar sun, as he looks forward in search of his hoped-for discovery. Now, that tells the whole story. If I were to have prepared an annual address, I could not have stated it more succinctly or more fully. It gives me the greatest pleasure, on the part of the American Society and the people of America, to be here to-day to make this presentation. I am sure that science, together with art and literature, form enduring links which will perpetuate the friendship that now exists between the two countries. For if the brains of two nations are always working together, how can their hearts be far apart? And so, Mr. President, by your leave, I deliver and present this medal to Sir John Murray, wishing him, on the part of the Society who gives it and the country I represent, long life and still more distinction than he has already achieved. He is equally at home on the floor of the ocean as upon dry land, and it is to zeal and enthusiasm, and perseverance, such as he has always exhibited in the cause of science, that its future victories will be due, and the arctic and antarctic regions alike will give up their secrets, and science will have mastered the whole world.

Sir JOHN MURRAY: It is my first duty to thank the President, the Council, and the Fellows of the American Geographical Society for the high honour they have conferred upon me in awarding me this Cullum Gold Medal of the Society. In the next place, I think it is my duty to thank his Excellency the Ambassador of the United States for the flattering terms in which he has referred to me personally, and for the grace with which he has spoken of scientific men generally. I am informed, and I believe correctly, that this medal has twice been conferred before this, once on a distinguished countryman of your own, Lieut. Peary, and upon Dr. Nansen. Both these gentlemen are friends of my own, and they have made noble journeys in the cause of science and of geographical work under conditions of great hardship, and they have been successful. I can lay claim to having done nothing that can in any way be compared with their endurance and their resource under great troubles and difficulties; but I feel there is a certain satisfaction—I feel this myself, and I believe it is shared by other scientific men, that the American Geographical Society also appreciates long-continued and combined effort in the cause of the acquisition of knowledge concerning the surface of the planet on which we live; for I regard this award, not so much as for any personal merit that belongs to myself, but as a recognition of the valuable work that has been performed by the great expedition with which my name is now so often associated, and therefore the honour is shared by all my colleagues, naval, literary, and scientific. I would mention that among the most distinguished contributors to the great report of the *Challenger*, no less than three of the large volumes have been prepared by your own countrymen—Prof. Alexander Agassis; Prof. Lyman, of Harvard; and Prof. Brooks, of Johns Hopkins University.

One of our poets says—

> "Lands intersected by a narrow firth abhor each other,
> Mountains interposed make enemies of nations, who had else,
> Like kindred drops, been mingled into one."

On some portions of the Earth's surface this may still be true, but many of the civilized nations are fast outgrowing that state of things. To all those who watch the wheels of Nature's mazy plan, and learn the future by the past of man, it must appear evident that humanity is slowly rising to a higher intellectual plane; not only the narrow firth, but the great ocean itself has become a theatre where scientific men meet, where all are willing to help each other and to combine in order to increase natural knowledge; not alone on the ocean, but geologists and other scientific men unite in mountain ranges to study their origin. In these and a hundred other ways there is being woven between the nations gossamer threads of thought and endeavour, which may ultimately prove so strong that not all the engines of modern warfare shall be able to break them. At all events, the feeling of sympathy, especially among all scientific men in all parts of the world, is certainly combining to indicate the lines along which these diplomatic cables may be laid, by which it is hoped to bind nations into something like a peaceful brotherhood. Allow me to ask you to convey to the Council of the American Geographical Society my own expression of high appreciation of this honour, and also the appreciation of all my colleagues, and I hope I may say of all British scientific men. This seems to be the silken thread of sympathy stretched between two great and kindred nations.

The visitors then withdrew, and the President having appointed Captain Henderson Smith and Captain Stiffe scrutineers, the election of the Council for the ensuing year was proceeded with.

The Hon. Secretary, Major Darwin, read the report of the Council for the past year; this will be published in the Year-Book for 1900.

The President then announced that the Council, as proposed, had been elected. The list is as follows, the names of new members, or those who change office, being printed in italics:—

President:—Sir Clements Markham, K.C.B., F.R.S., F.S.A. *Vice-Presidents:* Hon. G. C. Brodrick; Right Hon. Sir George D. Taubman Goldie, K.C.M.G.; *Colonel Sir Thomas Hungerford Holdich*, R.E., K.C.I.E., C.B.; Admiral Sir F. Leopold McClintock, K.C.B., D.C.L., F.R.S.; Admiral Sir W. J. L. Wharton, K.C.B., F.R.S.; General Sir Chas. W. Wilson, R.E., K.C.B., K.C.M.G. *Treasurer:* Edward L. Somers Cocks. *Trustees:* Right Hon. Sir John Lubbock, Bart., F.R.S., M.P.; Sir Cuthbert E. Peek, Bart., F.R.A.S., F.S.A. *Hon. Secretaries:* Major Leonard Darwin, R.E.; James F. Hughes. *Foreign Secretary:* Sir John Kirk, K.C.B., G.C.M.G., F.R.S. *Councillors: Sir H. E. G. Bulwer*, G.C.M.G.; W. T. Blanford, LL.D., F.R.S.; Colonel George Earl Church; Clinton T. Dent; *Major-General Sir Francis W. de Winton*, R.A., G.C.M.G., C.B.; Colonel Sir W. Everett, K.C.M.G.; *Major S. C. N. Grant*, R.E.; *Admiral Sir R. Vesey Hamilton*, G.C.B.; Admiral Sir Anthony H. Hoskins, G.C.B.; *Colonel Augustus le Messurier*, R.E., C.I.E.; Right Hon. Lord Loch, G.C.B., G.C.M.G.; George S. Mackenzie, C.B.; General Sir H. W. Norman, G.C.B., G.C.M.G.; *Duke of Northumberland*, K.G.; Sir George S. Robertson, K.C.S.I.; *Howard Saunders*, F.Z.S.; Frederick Courtney Selous; Herbert Warington Smyth; Lord Stanmore, G.C.M.G.; Colonel Sir Henry R. Thuillier, R.E., K.C.I.E.; Colonel Charles Moore Watson, R.E., C.M.G.

THE ANNIVERSARY DINNER.

In the evening the anniversary dinner took place in the Whitehall Rooms. The President, Sir Clements R. Markham, K.C.B., occupied the chair. There were 260 present, including the following distinguished guests: the American Ambassador, the Belgian Minister, the Argentine Minister, the Chilian Minister, the Bolivian Minister, the Earl of Camperdown, the Earl of Lichfield, Colonel Count Du Pontavice de Heussey, Lord Justice Vaughan Williams, Field-Marshal Sir Donald Stewart, General Sir George White, Admiral S. C. Holland, Lord Bangor, Admiral Sir R. Tracey, Captain Egerton, R.N., C.B., Colonel L. W. Longstaff, Sir H. E. L. Bulwer, Sir Charles Hall, Sir J. Savory, M. A. Bertrand, Sir G. Fitzgerald, Sir W. B. Richmond, Dr. F. P. Moreno, Mr. G. E. Buckle, Sir John Durstan, Mr. W. E. Smith (Chief Constructor), Abbé Rénard, M. Arçtowski.

The PRESIDENT proposed the toasts of "The Queen," "The Prince of Wales and Duke of York, Vice-Patron and Hon. President," and "The Navy and Army and Auxiliary Forces." He coupled the latter with the names of Admiral Sir R. E. Tracy, Field-Marshal Sir Donald Stewart, and Colonel L. W. Longstaff. In asking Colonel Longstaff to respond for the Auxiliary Forces, the President said that he would ever be remembered in that Society and by all geographers for the munificent gift by which he altered their struggling attempt to organize an antarctic expedition into a national undertaking.

The PRESIDENT, in proposing "Our Medallists," said that it had been the duty of the Council this year to award the two medals to two Frenchmen—Captain Binger and M. Foureau. As geographers the explorers of the two nations had only known friendly emulation. He felt that Field-Marshal Sir Donald Stewart hit the right nail on the head when he mentioned the name of Major Marchand. We felt the greatest admiration for the very remarkable journey that Marchand had made. It had scarcely, if ever, been equalled, and he would, in the name of that Society, request his friend the Count du Pontavice to convey to Major Marchand their warm, their hearty congratulations and expressions of admiration. In the unavoidable absence of Captain Binger and of M. Foureau, he coupled the name of Count du Pontavice de Heussey with the toast.

Count DU PONTAVICE DE HEUSSEY said in reply: Let me thank you, in the first place, for the great honour you have done me in asking me to respond to the toast we have just heard so eloquently proposed, and let me express my gratitude for the enthusiastic manner in which the names of your medallists MM. Binger and Foureau have been received. I must confess that I feel a certain timidity in addressing you to-night, for I know and feel that you would have been glad to see one at least of the gentlemen you have so greatly honoured rise in his place at this table to make his own acknowledgment of the distinction they both so greatly value. But I will do my duty, a very pleasant duty, to the best of my ability, and must ask your indulgence if I fail to express my countrymen's gratitude as it should be expressed.

Captain Binger has charged me to tell you how deeply he regrets that the duties of his office utterly forbids his travelling to London, and to add that his immense pride and satisfaction at the honour you have done him are materially increased by his conviction that in his person, and that of M. Foureau, you desire to recognize the services done by the whole body of French explorers to the cause of civilization in the continent of Africa. You may be sure, gentlemen, that M. Foureau—who has spent so many years of patient labour, not in exploration only, but in accumulating valuable geodetic observations in the regions of the Great Sahara—shares Captain Binger's feeling on this point. In his case, doubtless,

present words will be replaced by future maps, and his thanks will ultimately, when his long journey comes to an end, take the shape of further proof that he is a worthy recipient of your Patron's Medal.

I think I may venture to offer my own congratulations, and those of the two fellow-countrymen I am so proud to represent to-night, to the gentlemen who have been honoured in their company by your Society. All of these gentlemen are worthy labourers in the great field of research, and richly deserve the distinction bestowed upon them. And I would add a special word of felicitation to the distinguished Englishman who has this day received from the hands of the American Ambassador the medal awarded him by the American Geographical Society. I am convinced Sir John Murray values his well-merited honour a thousandfold, coming as it does through the hands of his Excellency the Ambassador of the United States, and for my part, I feel a special pride and satisfaction in being present on this auspicious occasion, for I feel no doubt that his Excellency remembers that, though we Frenchmen are not so closely bound to America by ties of common blood as are the Englishmen I see round this hospitable board, yet certain fair states of the union were once French provinces, and the descendants of those old French settlers are now the loyal, the contented, the devoted citizens of the great American Republic which he so worthily represents.

Another name has fallen from the lips of your distinguished President, and has been coupled by him with those of heroes whose efforts to solve the riddles hidden in the depths of unknown countries have already made them famous. Commandant Marchand will treasure as a special honour, among the many showered on him, the greeting just sent him in the name of science. I believe I may assert that he brings back from his long and weary journey certain scientific facts and discoveries which will attract the curious and the wise, and go some way towards clearing up some of the problems left unsolved by that line of illustrious predecessors in African exploration among whom we number Barth, Livingstone, Baker, Speke, Stanley, Cameron, Sir George Goldie, and many others less known, perhaps, but not less brave and untiring.

The mention of the brave French soldier's name will, I feel sure, have given pleasure to the brave English soldiers now sitting round your table, and specially those who were in the memorable Sudan campaign—to Colonel Macdonald, who has just come back from the very country through which Marchand travelled; and Lieut. Vandeleur, who clasped his hand under the African sky, and, I doubt not, feels for him that friendly appreciation and admiration which bravery and patience rouse in the heart of every brave man, whether friend or foe.

Your President has drawn an eloquent picture of the efforts made by Englishmen, at the risk of their own lives, to succour French savants and explorers lost in distant and perilous undertakings in far countries, and he has not failed to tell us, too, how Frenchmen have gallantly striven to carry help to English expeditions in like dangerous cases.

As he spoke, a figure rose up before me, the figure, gentle, kind, though commanding, of a woman—a face that is graven on the hearts of millions of faithful and loyal subjects. And I remembered (let us all remember it always) that this great Queen of yours loves France, her old friend and ally; that under her rule Frenchmen and Englishmen have fought and died side by side in Europe as well as in more distant countries. I felt, when once more your President's story of the self-sacrifice of Englishmen for Frenchmen, and French for Englishmen, made your hearts glow and your eyes shine, that the two nations, whatever newspapers may say, are born to understand each other. Let each one of us do our part, so that no foolish quarrel of petty jealousy shall disturb our friendship; let us take example

by the lives of noble endeavour to which this great Society does honour this night. Let us spend our courage, our strength, our best endeavour in a united effort to widen the mighty circle of civilization, to build up the walls of science, to wage undying war against ignorance and barbarism.

Major DARWIN proposed "The Sister Societies," which was responded to by Mr. T. G. ROOPER. Sir GEORGE GOLDIE gave the toast of "The Guests," which was responded to by the American Ambassador; and in conclusion Sir JOHN MURRAY proposed the toast of "The President."

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alpine Hints. **Ball.**

Hints and Notes practical and Scientific for Travellers in the Alps, being a Revision of the General Introduction to the 'Alpine Guide.' By the late John Ball, F.R.S., &c. A New Edition prepared on behalf of the Alpine Club by W. A. B. Coolidge. London: Longmans & Co., 1899. Size 7½ × 5, pp. clxiv. *Price* 3s. *net. Two copies, one presented by the Publishers, the other by the Alpine Club.*

Many of the articles have been altered, and some practically re-written, a few new articles are added. and one old one omitted, so that this edition is practically a new work. The book is divided into three parts—Practical hints to travellers in the Alps; Scientific notes on geology, natural history, and photography; and Appendices, consisting of an Alpine Bibliography and a Glossary of Alpine terms.

Alps. *B.S. Neuchateloise G.* 11 (1899): 5-26. **Schardt.**

Les Préalpes Romandes (Zone du Stockhorn-Chablais)—Un problème de géologie alpine. Par Hans Schardt. *With profiles.*

Alps. **Tyndall.**

Hours of Exercise in the Alps. By John Tyndall, LL.D., F.R.S. New Edition. London: Longmans & Co., 1899. Size 8 × 5½, pp. xii. and 482. *Illustrations. Price* 6s. 6d. *net. Presented by the Publishers.*

This edition has been supplied with an index, but, except for some verbal changes indicated by the author does not differ from the previous edition.

Alps—Eastern. *Mem. S.G. Italiana* 8 (1898): 338-415. **Marinelli.**

Studi orografici nelle Alpi orientali del socio prof. Olinto Marinelli. *With Illustrations.*

Austria—Geographical Progress. *M.G. Ges. Wien* 41 (1898): 1–318. ——

Die Pflege der Erdkunde in Oesterreich 1848–1898. Festschrift der k. k. Geographischen Gesellschaft.

On the work done by various organizations in Austria during the last half-century.

Austria—Gmunden Lake. *Petermanns M.* 45 (1899): 41–42. **Richter.**

Stehende Seespiegelschwankungen (Seichen) auf dem Traunsee. Von Prof. Dr. E. Richter.

This subject is referred to in the *Journal* for June, vol. xiii. p. 656.

Austria—Meteorology. ——

Jahrbücher der k. k. Central-Anstalt für Meteorologie und Erdmagnetismus. Jahrgang 1894, Neue Folge xxxi. Band. (Pp. xxvi. and 192); Jahrgang 1897. Neue Folge xxxiv. Band, I. Theil. Wien, 1898. Size 12 × 9½, pp. 144 and 40.

Austria-Hungary—Dalmatia. *Abrégé B.S. Hongroise G.* 26 (1898): 17–42. **Havass.**

Dalmatien in seinen Beziehungen zu Ungarn mit Rücksicht auf Fiume. Von Dr. Rudolf Havass.

Compares the condition of Dalmatia now and twelve years ago, and suggests that the renewal of the ancient Hungarian rights over Dalmatia would tend to the rapid progress of that country.

Bulgaria. *Mem. S. Spéléologie* 3 (No. 15) (1898): 1–46. **Scorpil.**

Sources et Pertes des Eaux en Bulgarie. Par MM. H. et K. Scorpil. *With Maps and Illustrations.*

Central Europe—Earthquakes. **Günther.**

Jahresb. G. Ges. Munchen, 1896 *u.* 1897 (1898): 76–88.

Das bayerisch-böhmische Erdbeben vom Jahre 1329. Von Prof. Dr. S. Günther.

Denmark. ——

Observations météorologiques-nautiques, 1898, publiées par l'Institut Météorologique de Danemark. Kjøbenhavn, 1899. Size 12½ × 9½. *Maps.*

Europe—Historical. *T. Liverpool G.S.* (1898): 44–63. **Nevins.**

Geographical Picture of Mediæval Europe during the Thirteenth Century. By J. Birkbeck Nevins, M.D.

Europe—Military Geography. **Barré.**

La Géographie Militaire et les nouvelles méthodes géographiques. Introduction à l'Étude de l'Europe Centrale. Par O. Barré. Paris: Berger-Levrault & Cie, 1899. Size 10 × 6½, pp. 80. *Maps and Plate. Presented by the Publishers.*

This treats of the geomorphological basis of all geography, but with special regard to military applications.

France—Statistics. ——

Statistique Générale de la France. Tome xxiv. Statistique Annuelle (Année 1894). Paris, 1897. Size 11 × 7½, pp. x. and 250. *Presented by the French Minister of Commerce, Industry, etc.*

Germany. *P.I. Civil Engineers* 135 (1899): 224–257. **Franzius and Thierry.**

River Regulation Works, and Harbour and Canal Construction in Germany. By Ludwig Franzius and George Henry de Thierry. *With Plates.*

This paper describes the harbour works of Bremen and Bremerhafen, the regulation of the lower course of the Weser, the ports of Hamburg and Stettin, the North Sea-Baltic canal, the ship-canal between Dortmund and the Ems, the Elbe-Trave canal, and the improvement works on the Oder and Vistula.

Germany. *Globus* 75 (1899): 265–268. **Halbfass.**

Das Steinhuder Meer. Von Dr. Halbfass.

A small lake in North Germany, in 52° 30′ N. and 27° E., about 5 miles long, and only 10 feet in maximum depth.

Germany. *Globus* 75 (1899): 194–195. **Halbfass.**

Der Seeburger See bei Göttingen. Von Dr. Halbfass.

Germany. **Niessen.**

Brown Coal Mining in the Rhineland. Foreign Office, Miscellaneous, No. 497. 1899. Size 10 × 6½, pp. 10. *Price* 1*d.*

Germany. *J.S. Arts* 47 (1899): 443–459. **Rozenraad.**

The Commercial Development of Germany. By C. Rozenraad.

Germany—Geology. ——

Naturw. Wochenschrift **13** (1898): 565, 613; **14** (1899): 33, 57.

Die allgemeine Versammlung der Deutschen geologischen Gesellschaft zu Berlin vom 26-28. September, 1898. Excursionen. ***Map and Diagrams.***

Notes on geological excursions in North Germany.

Germany—Historical. *Petermanns M.* **45** (1899): 57–66. **Gradmann.**

Der obergermanisch-rätische Limes und das fränkische Nadelholzgebiet. Von Dr. Robert Gradmann. ***With Map.***

On the Roman boundary against the free German tribes from the Main at Miltenberg southward and eastward to the Danube above Regensburg. To the east or north of this line a very large proportion of the place-names refer to pine-trees, while scarcely any names derived from coniferous woods occur to the west or south.

Germany—Oder. *G.Z.* **5** (1899): 19–47, 84–94. **Penck.**

Der Oderstrom. Von Albrecht Penck.

Germany—Prussia. *Naturw. Wochenschrift* **14** (1899): 172–173. ——

Ueber die Moore des Königreichs Preussen.

Germany—Prussia. *Globus* **75** (1899): 217–222. **Kellen.**

Die polnischen Niederlassungen im Ruhrkohlenreviere. Von Tony Kellen.

Greece—Patras. **Wood.**

Trade of Patras and District for the Year 1898. Foreign Office, Annual No. 2214. 1899. Size 9½ × 6½, pp. 16. *Price 1d.*

Hungary—Budapest. **Thirring.**

Statistisches Jahrbuch der Haupt- und Residenzstadt Budapest. I. Jahrgang, 1894. (Mit Rückblicken auf die Jahre 1874–1893.) II. Jahrgang, 1895 und 1896. Redigiert und bearbeitet von Prof. Dr. Gustav Thirring. Herausgegeben vom Statistischen Bureau der Haupt- und Residenzstadt Budapest. Budapest und Berlin: C. Grill, 1896–1898. Size 10½ × 7½, pp. (i.) xiv. and 340, (ii.) x. and 426. *Presented by Dr. Thirring.*

Hungary—Lake Balaton. ——

Resultate der wissenschaftlichen Erforschung des Balatonsees. . . . Erster Band. Physische Geographie des Balatonsees und seiner Umgebung. Vierter Theil. Erste Section. Der Klimatologischen Verhältnisse der Umgebung des Balatonsees. Von Dr. Johann Candid Sáringer (pp. 130); Zweite Section. Niederschlagsverhältnisse und Regenkarten (aus den Jahren 1882–1891). Verfasst von Odön v. Bogdánfy. Wien: E. Hölzel, 1898–99. Size 11½ × 8½, pp. 16. ***Maps.***

Iceland. *Travel* **3** (1899): 565–570. **Howell.**

Iceland, the Wonderland of Europe. What to see there, and how best to see it. An Interview with Mr. F. W. W. Howell. ***With Illustrations.***

Italy. *Riv. G. Italiana* **6** (1899): 32–43. **Battisti.**

Gli studi limnologici italiani nel 1898. Nota bibliografica del Dott. Cesare Battisti.

Italy. *B.S.G. Italiana* **12** (1899): 51–63. **Rosetti.**

Emilia e Romagna, nota del socio ing. Emilio Rosetti.

Italy—Alpine District. *Riv. G. Italiana* **6** (1899): 3–13. **Giannitrapani.**

Col. D. Giannitrapani. La regione alpina. (Descrizione sintetica.)

Italy—Caserta. *B.S.G. Italiana* **12** (1899): 103–108. **Agostini.**

Il lago del Matese (Provincia di Caserta). Nota del socio dott. Giovanni de Agostini. ***With Map.***

A small and very shallow lake, without visible outlet, in a valley about 3500 feet above sea-level.

Italy—Rome. **Murray.**

A Handbook of Rome and the Campagna. Sixteenth Edition. With Ninety-four Maps and Plans. London: John Murray, 1899. Size 7 × 5, pp. x., 126 and 496. *Price 10s.* ***Presented by the Publisher.***

Mediterranean—Cyprus. **Fyler.**

The Development of Cyprus, and Rambles in the Island. By Colonel Fyler. With coloured Illustrations, Maps, and Plans. London: P. Lund, Humphries & Co. [not dated]. Size 8½ × 6, pp. 138. ***Presented by the Publishers.***

A sketch of the history of Cyprus, followed by an account of its political and

financial position, its naval and military position as part of the British Empire, and its commercial position. The book concludes with some account of the scenery and tours, and the description of a trip from Troodos to Kyrenia and Famagusta.]

Montenegro. **Horák.**

Ergebnisse einer botanischen Reise nach Montenegro. Von Bohnslav Horák. (Sitzungsberichte der Königl. böhmischen Gesellschaft der Wissenschaften. Mathematisch-naturwissenschaftliche Classe. 1898.) Prag, 1898. Size 10 × 6, pp. 12.

Norway—Anthropology. *Skrifter Vidensk. Christiania* (1898, N. 6): 1-86. **Arbo.**

Fortsatte Bidrag til Nordmændenes Anthropologi. V. Nedenæs Amt. Af C. O. E. Arbo. *With Diagrams and Illustrations.*

Norway—Climate. *Skrifter Vidensk. Christiania* (1898, N. 2): 1-44. **Mohn.**

Klima-Tabeller for Norge. IV. Vind. Af H. Mohn.

Norway—Plants. *Skrifter Vidensk. Christiania* (1898, N. 9): 1-28. **Kaalaas.**

Beiträge zur Lebermoosflora Norwegens. Von B. Kaalaas. *With Illustrations.*

Pyrenees—Lakes. **Delebecque and Ritter.**

Quelques lacs des Pyrénées. Par A. Delebecque et E. Ritter. (Extrait des Archives des Sciences physiques et naturelles. Quatrième période, t. vi.—Novembre 1898.) Size 9 × 6, pp. 4.

A classified list of some of the lakes of the Pyrenees, with particulars as to their position, size, form, and depth.

Russia. *Ann G.* 8 (1899): 127-140. **d'Almeida.**

La colonisation russe dans les gouvernements d'Oufa et d'Orenbourg. Par M. P. Caména d'Almeida.

Russia. **Engelhardt.**

A Russian Province of the North. By Alexander Platonovich Engelhardt, Governor of the Province of Archangel. Translated from the Russian by Henry Cooke. London: A. Constable & Co., 1899. Size 10 × 6½, pp. xx. and 356. *Portrait, Maps, and Illustrations. Price* 18*s. Presented by the Publishers.*

The extreme north of European Russia has so long been linked with this country commercially, that this translation of the description of the province of Archangel by its most progressive and enterprising governor cannot fail to be of great interest. Each section of the vast province is dealt with separately, including the Kola peninsula, the Murman coast, Novaya Zemlya, and the Pechora country. There are statistical appendices, illustrations, and maps. The transliteration of Russian names is not in accordance with the recognized English usage. It is an error to speak (p. 29) of 65° N. as "within the arctic circle."

Russia—Botany. *Mém. A. Imp. Sci. St. Pétersbourg* 7 (1898): 1-566. **Korshinsky.**

Tentamen Florae Rossiae orientalis, id est provinciarum Kazan, Wiatka, Perm, Ufa, Orenburg, Samara partis borealis atque Simbirsk. Auctore S. Korshinsky. *With Maps.*

Russia—Finland. *Fortnightly Rev.* 65 (1899): 735-744. **Bain.**

Finland and the Tsar. By R. Nisbet Bain.

On the proposed changes in the political system of Finland.

Russia—Finland. *Nineteenth Century* 45 (1899): 699-715. **Reuter.**

Russia in Finland. By Dr. J. N. Reuter.

Dr. Reuter, a member of the University of Helsingfors, states very clearly the present political position in Finland, and the serious nature of the Tsar's recent action with regard to the constitution of the grand duchy.

Russia—Finland. *Contemporary Rev.* 75 (1899): 652-659. **Westermarck.**

Finland and the Czar. By Professor Edward Westermarck.

Servia. **Macdonald**

Trade of Servia for the years 1897-98. Foreign Office, Annual 2207, 1899. Size 9½ × 6¼, pp. 18. *Price* 1½*d.*

Spain. *G.Z.* 5 (1899): 177-189. **Maerker.**

Die geographischen Ursachen von Spaniens Niedergang. Von Prof. Julius Maerker.

On the geographical causes of the decline of Spain.

Spain—Corunna. **Talbot.**
Trade of Corunna and District for the year 1898. Foreign Office, Annual No. 2216, 1899. Size 9½ × 6, pp. 34. *Map. Price 4d.*

Contains a railway map, showing the new direct route from Corunna to Madrid.

United Kingdom. *Symons's Monthly Meteorolog. Mag.* **34** (1899): 33–36. ———
Winter Minima on British Mountain Tops.

United Kingdom. *Natural Sci.* **14** (1899): 273–289. **Buckman.**
The Development of Rivers; and particularly the Genesis of the Severn. By S. S. Buckman. *With Sketch-maps.*

See note in *Journal.*

United Kingdom. *J.S. Arts* **47** (1899): 475-496. **Hunter.**
London's Water Supply. By Walter Hunter.

United Kingdom—Coal. *J.S. Arts* **47** (1899): 506-517. **Brown.**
Our Coal Supplies. By T. Forster Brown.

Treats of the extent of the British coalfields as compared with those of Germany, the United States, China, and other countries.

United Kingdom—England. **Murray.**
A Handbook of Warwickshire. London: John Murray, 1899. Size 7 × 4½, pp. vi. 14, and 140. *Maps and Plans. Price 6s. Presented by the Publisher.*

The issue of this new handbook completes the description of the counties of England in Mr. Murray's series, which forms a remarkable compendium of the history of the country. The new volume is well illustrated by maps and plans.

United Kingdom—Hampshire. **Murray.**
A Handbook for Travellers in Hampshire. Fifth Edition. With Maps and Plans. London: John Murray, 1898. Size 7 × 5, pp. 18 and 214. *Price 6s. Presented by the Publisher.*

United Kingdom—Isle of Wight. **Jeans.**
A Handbook for Travellers in the Isle of Wight. With an Introductory Sketch of the History of the Island, by R. E. Prothero, M.A. Edited by the Rev. G. E. Jeans, M.A. Fifth Edition. London: John Murray, 1898. Size 7 × 4½, pp. 54 and 70. *Map. Price 2s. 6d. Presented by the Publisher.*

United Kingdom—London. **Ghewy.**
Real Municipal Government for London. A Scheme for the Government of the Area known as the Administrative County of London, with the "City" included, by applying the Municipal Corporation Acts. By Albert Brown Ghewy. London: printed by J. B. Nichols & Sons, 1899. Size 8½ × 5½, pp. 22.

United Kingdom—London. **Symons.**
Symons's Monthly Meteorolog. Mag. **34** (1899): 17–18.
Extremes of Temperature in London and its Neighbourhood for 104 years.

With reference to the high temperature (max. 64°·8) recorded in February, 1899, Mr. Symons has prepared a table of absolute maxima and minima of air-temperature in London at three stations. We reproduce those for Greenwich observatory for the period 1841–1890 :—

Month ...	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Max. ...	57·0	64·3	71·5	81·5	87 0	94·5	97·1	94·2	92·1	81·0	67·3	62·4
Year ...	1843	1846	1848	1865	1868	1858	1881	1884	1868	1859	1847	1848
Min. ...	4·0	7·7	13·1	23·0	28·1	35 6	40·3	38·2	33·0	23·8	20·1	6·7
Year ...	1841	1845	1845('90)	1847	1877	1869	1863	1864	1885	1890	1890	1860

United Kingdom—Trade. *J.R. Statistical S.* **62** (1899): 1–82. **Giffen.**
The Excess of Imports. By Sir Robert Giffen.

A study of the excess of imports over exports in British trade, and of the distribution of the trade amongst foreign countries.

ASIA.

Armenia. *M.G. Ges. Hamburg* **15** (1899): 1–23. **Belck and Lehmann.**
Reisebriefe von der Armenischen Expedition der Herren Dr. W. Belck und Dr. C. F. Lehmann. *Also separate copy. Presented by Dr. L. Friederichsen.*

Asia Minor Railway. *B.S.G. Lyon* **15** (1899): 487-489. **Morel.**
Le chemin de fer projeté entre la Méditerranée et le Golfe Persique. Par M. Ennemond Morel.

Central Asia. *Verh. Ges. Erdk. Berlin* 26 (1899): 139–150. **Futterer and Holderer.**

Dritter Bericht über die Reise durch Central-Asien und China. Von Prof. Dr. K. Futterer und Dr. Holderer.

This section of the journey from Kuku-nor to Shanghai was described in the *Journal* for April, vol. xiii. p. 430.

China. *B.S.G. Marseille* 22 (1898): 169–174. ———

En Chine: La part de la France. Par M. C. S.

China. *B.S.G. Com. Paris* 21 (1899): 80–97. ———

Notice géographique, ethnographique et commerciale sur le haut Fleuve Rouge (De Yuan-kiang à Man-hao). *With Map.*

China. *B.S.G. Italiana* 12 (1899): 156–163. **Carli.**

La baia di San-men. Nota del dott. Mario Carli. *With Map.*

China. *Rev. Française* 24 (1899): 157–164. **Servigny.**

Les chemins de fer en Chine. Par J. Servigny. *With Map.*

China. **Thomson.**

Through China with a Camera. By John Thomson. [Second Edition.] London and New York: Harper & Bros., 1899. Size 8¾ × 6, pp. xvi. and 270. *Illustrations. Price* 7*s.* 6*d. Presented by the Publishers.*

This edition is enriched with additional notes and some additional illustrations, the reproduction and printing of which do justice to the beauty of the original photographs.

China—Hainan. *B.S.G. Genève* 38 (1899): 40–51. **Jeremiassen.**

Haïnan, l' île de l'Exil. Par M. Carl C. Jeremiassen.

Chinese Empire—Tibet. *C. Rd. S.G. Paris* (1899): 124–127. **Grenard.**

Voyage de M. et Mme Rijnhart dans le Tibet oriental. Par F. Grenard.

The Rijnharts made a missionary journey in Eastern Tibet in the summer of 1898; they started from Si-ning, passed Kuku-nor, and at Barong took the road to Lhasa, crossed the Tang-la and Tatsang passes, and reached the boundary of the kingdom of Lhasa, near Chungngoringmo and were turned back towards Tachienlu. The caravan was robbed by Tibetan bandits, M. Rijnhart was drowned or killed in fording a river, and Mme. Rijnhart entirely alone succeeded in regaining China.

Eastern Asia. **Széchenyi.**

Wissenschaftliche Ergebnisse der Reise des Grafen Béla Széchenyi in Ostasien 1877–1880. Dritter Band. Die Bearbeitung des gesammelten Materials. Wien: E. Hölzel, 1899. Size 11½ × 9, pp. viii. and 524. *Plates. Presented by the Author.*

This volume discusses the geological collections and meteorological observations made during Count Béla Széchenyi's great journey, and completes the scientific publications. It contains the photograph of a sketch of the city of Lhasa. The work which has now appeared in Hungarian and German is promised in English also as soon as a publisher can be found; the atlas and plates for the English edition are already prepared.

Eastern Asia. *Oester. Monats. Orient* 25 (1899): 25–31. **Wiesenburg.**

Die Wirthschaftsverhältnisse Ostasiens. Vom kaiserlichen Rath A. Wiesenburg.

Eastern Asia—Typhoons. *Meteorolog. Z.* 16 (1899): 145–157. **Bergholz.**

Die Taifune vom 9 und 29. September 1897. Von Dr. Paul Bergholz. *With Diagrams.*

India. *J. United Service I. India* 28 (1899): 1–24. **Sinclair.**

The First Sikh War, 1845–46. By Lieut.-Colonel H. M. Sinclair, R.E. *With Plans.*

India—Andaman Islands. **Portman.**

Notes on the Languages of the South Andaman Group of Tribes. By M. V. Portman. Calcutta, 1898. Size 11 × 9 pp. viii., 390, and 192. *Map. Presented by the India Office.*

This important study of the Andamanese languages is accompanied by a coloured map (the large-scale Admiralty chart) showing the districts occupied by the various tribes.

India—Assam. **Peal.**

Ein Ausflug nach Banpara von S. E. Peal. Nach der Original-Handschrift übersetzt und mit einer Einteilung versehen von Kurt Klemm. (Zeitschrift für

Ethnologie. Jahrg. 1898.) Size 10 × 6½, pp. 281–371. *Maps and Illustrations. Presented by the Translator.*

Translation of an article in the *Journal* of the Asiatic Society of Bengal, vol. 41, pp. 9–31.

India—Burma. *J. United Service I. India* **28** (1899): 34–55. **Keene.**
The Third Burmese War, 1885–87. By Major A. Keene. *With Map.*

India—Mysore. **Rice.**
Mysore. A Gazetteer compiled for Government. Revised Edition. By B. Lewis Rice. 2 vols. Vol. i.—Mysore in General. Vol. ii.—Mysore, by Districts. London: A. Constable & Co., 1897. Size 9 × 6, pp. (vol. i.) xx. and 834; (vol. ii.) viii. and 582. *Maps and Plates. Presented by the Publishers.*

The second edition of this valuable work is enriched with a profusion of excellent maps, historical, physical, economic, and topographical. The book is much more than a gazetteer, giving a complete account of Mysore from all points of view.

India—Punjab. *Imp. and Asiatic Quarterly Rev.* **7** (1899): 263–276. **Roe.**
The Tribes and the Land of the Panjáb. By Sir Charles Roe, Bart.

India—Railways. *Questions Dipl. et Colon.* **6** (1899): 413–419, 483–488. **Franconie.**
Le Régime des Chemins de fer dans l'Inde Anglaise. Par J. Franconie. *With Map.*

India—Vizagapatam. **Bion.**
Notes on the Meteorology of Vizagapatam. Part i.—Rainfall. By W. A. Bion. Calcutta, 1898. Size 9½ × 6½, pp. 40. *Diagrams.*

Indian Ocean—Cocos-Keeling and Christmas Islands. **Farrer.**
Cocos-Keeling and Christmas Islands. Report on the Annual Visit for 1898. Colonial Reports, Annual. No. 257, 1899. Size 10 × 6½, pp. 16. *Price* 1*d.*

Japan. *J.G. Tōkyō G.S.* **9** (1897): 534–536, 590–594. **Nasa.**
Harbours of Japan. By T. Nasa. [In Japanese.]

Japan. **Ribaud.**
Miss. Catholiques **31** (1899): 6, 18, 31, 42, 55, 66. 81, 91, 104, 113, 126, 139, 148, 160. Japon historique et artistique (Kamakura et Nikko). Ruines et Mausolées. Par M. Michel Ribaud. *With Illustrations.*

Korea. *B.S.G. Paris* **19** (1898): 489–496. **Fauvel.**
Tche-nam-po, nouveau port Coréen. Par A.-A. Fauvel. *With Map.*

Malay Archipelago. *Ann. Hydrographie* **27** (1899): 81–89, 123–136. ———
Riouw- und Lingga-Archipel.

Malay Archipelago. *C. Rd. S.G. Paris* (1898): 370–372. **Hiller, Hamson, and Furness.**
Insulinde. Voyage de MM. Hiller, et C. Hamson, et du Dr. W.-H. Furness. *With Map.*

Malay Archipelago—Borneo. *Contemporary Rev.* **75** (1899): 578–587. **Jardine.**
British North Borneo. By Sir John Jardine.

Malay Archipelago—Java. **Allan.**
P. and T. Queensland Br. R.G.S. Australasia **13** (1899): 36–61.
Anniversary Address. Java. By the Hon. Wm. Allan. *With Map.*

Philippine Islands. *B.S.G. Madrid, Rev.* **1** (1898): 249–251. ———
Archipiélago Filipino. Las islas Bisayas.

Philippine Islands. **Foreman.**
The Philippine Islands. A Political, Geographical, Ethnographical, Social, and Commercial History of the Philippine Archipelago and its Political Dependencies, embracing the whole Period of Spanish Rule. By John Foreman. Second Edition, Revised and Enlarged. London: Low & Co., 1899. Size 9½ × 6½, pp. xvi. and 654. *Maps and Illustrations. Price* 21*s. Presented by the Author.*

Philippine Islands. *Oester. Monats. Orient* **25** (1899): 42–44. **Post.**
Die Philippinen. Von N. Post.

Discusses the geographical position and resources of the Philippines from an economic point of view.

Philippine Islands. *National G. Mag.* **10** (1899): 65–72. **Sonnenburg.**
Manila and the Philippines. By Major A. Falkner von Sonnenburg.

Philippine Islands. *National G. Mag.* 10 (1899): 33–64. **Tornow.**
The Economic Condition of the Philippines. By Max L. Tornow. *With Illustrations.*

Philippine Islands. **Younghusband.**
The Philippines and Round About. with some account of British Interests in these Waters. By Major G. J. Younghusband. London: Macmillan & Co., 1899. Size 9½ × 6, pp. xiv. and 230. *Map and Illustrations. Price* 8*s.* 6*d. Presented by the Publishers.*

Russia—Caucasus. **Rickmers.**
Z. Deutsch. u. Österreich. Alpenver. 29 (1898): 182–189.
Der Uschba im Kaukasus. Von Willy Rickmer-Rickmers. *With Illustrations.*
Also separate copy. *Presented by the Author.*

Russia—Siberia. *Scottish G. Mag.* 15 (1899): 178-185. ———
Olkhon and the Buriats.

Russia—Siberia. *Petermanns M.* 45 (1899): 67–70. **Romanow.**
Das Gouvernement Tomsk. Nach den statistischen Veröffentlichungen im sibirischen Handels- und Gewerbebuch von F. P. Romanow. Ins Deutsche übertragen von F. Thiess.

On the geography and statistics of the government of Tomsk, translated from the Russian.

Russia—Siberia. *Rev. Scientifique* 11 (1899): 391–402, 426–433. **Silnitzky.**
La province d'Anadyr (Sibérie orientale) et son administration. Par M. A. Silnitzky. *With Illustrations.*

The author is the editor of the *Official Journal* at Vladivostok, and the article is an account of a visit he paid to the extreme north-eastern province in 1896 on the annual supply-ship.

Russia—Siberia. *J. Linnean S. (Zoology)* 27 (1899): 23–46. **Elwes.**
On the Zoology and Botany of the Altai Mountains. By H. J. Elwes, F.R.S. *With Illustrations.*

Russia—Siberia. *P.R. Artillery I.* 26 (1899): 107–120. **Waters.**
The Trans-Siberian Railway. By Lieut.-Colonel W. H. H. Waters. *With Map.*

Russian Central Asia. **Gallois.**
B.S.G. Lille 30 (1898): 327–337; 31 (1899): 9–25, 80–103.
Excursion à la capitale de Tamerlan. Par M. Eugène Gallois. *With Map and Illustrations.*

A visit to Samarcand.

Russian Central Asia. **Krafft.**
Mittheilungen über das ost-bokharische Goldgebiet. Von Dr. Albrecht von Krafft. [From *Zeitschrift für praktische Geologie*, Jahrgang 1899. Februar.] Size 11 × 7½, pp. 37-43. *Sketch-map. Presented by the Author.*

Turkey—Palestine. **Bliss.**
Palestine Exploration Fund, Quarterly Statement (1899): 10-25.
First Report on the Excavations at Tell Zakarîya. By F. J. Bliss, PH.D. *With Map and Sections.*

Turkey—Palestine. **Dickson.**
Trade of Jerusalem and Jaffa for the year 1898. Foreign Office, Annual No. 2217, 1899. Size 10 × 6½, pp. 10. *Price* 1*d.*

Turkey—Palestine. *Ann. G.* 8 (1899): 160–169. **Mille.**
Colonies juives et allemandes en Palestine. Par M. P. Mille.

Turkey—Syria. *B.S.G. Italiana* 12 (1899): 62-63. **Manfredi.**
Nuova Carta della regione ad Oriente del Mar Morto, del P. don Giuseppe Manfredi. *With Map.*

The map, which takes in an area from 30° 55′ to 31° 50′ N. on the eastern side of the Dead sea, is drawn by Fathers Manfredi and Barberis of the Latin Patriarchate in Jerusalem.

Turkey—Syria. *Palestine Exploration Fund, Quarterly Statement* (1899): 47-56. **Sykes.**
Narrative of a Journey East of Jebel ed-Druse. By Mark Sykes.

Western Asia. **Oppenheim.**

Vom Mittelmeer zum Persischen Golf durch den Haurân, die Syrische Wüste und Mesopotamien. Von Dr. Max Freiherrn von Oppenheim. Erster Band. Berlin: Dietrich Reimer (Ernst Vohsen), 1899. Size 10 × 7, pp. xvi. and 334. *Maps and Illustrations. Presented by the Publisher.*

This work is based on a journey from Beirut through the Hauran, the Syrian desert, and Mesopotamia to the Persian gulf in 1893, which has already been described in *Petermanns Mitteilungen*. But there is much more than the description of a journey in this finely illustrated volume, which carries on the narrative as far as the Euphrates, with many details regarding people and antiquities, and a number of excellent maps. A large-scale map of the route will accompany the second volume.

AFRICA.

Abyssinia. *B.S. Neuchateloise G.* 11 (1899): 137–162. **Buchs.**

Voyages en Abyssinie, 1889–1895. IIe Parti. Par Victor Buchs. *With Illustrations.*

Africa—Trade. ——

Trade and Shipping of Africa. Reprint, with additions, from the *Board of Trade Journal*, of articles dealing with the Trade, Shipping, Railways, and the Economic Condition generally, of the various divisions of the African Continent and of Madagascar. London: Eyre & Spottiswoode, 1899. Size 10 × 6½, pp. viii and 120. *Maps. Price* 1*s.* 6*d.*

British East Africa—Uganda. **Ansorge.**

Under the African Sun. A description of Native Races in Uganda, Sporting Adventures, and other experiences By W. J. Ansorge. London: W. Heinemann, 1899. Size 10½ × 6½, pp. xiv. and 356. *Illustrations. Price* 21*s.*

The description of life in Uganda is supplemented by accounts of the natural history collections made by the author.

British South Africa—Barotseland. *B.S. Neuchateloise G.* 11 (1899): 93–101. **Béguin.**

Au Bo-Rotse. Par Eugène Béguin.

The author was a missionary in Barotseland.

British West Africa—Ashanti. *B.S. Neuchateloise G.* 11 (1899): 116–118. **Perregaux.**

Le lac Obosomtwé. Par E. Perregaux.

An account of the old fetish lake of Ashanti.

Cape Colony. ——

Cape of Good Hope. Department of Agriculture. Annual Report of the Geological Commission, 1897. Cape Town, 1898. Size 10½ × 8, pp. 84. *Maps and Sections. Presented by the Commission.*

Cape Verde Islands. *B.S.G. Italiana* 12 (1899): 163–174. **Fea.**

Dalle Isole del Capo Verde. Lettera del Leonardo Fea. *With Illustrations.*

Congo State—Dwarf Tribes. *B.S.R.G. d'Anvers* 22 (1899): 277–279. **Dubreucq.**

Les populations naines de l'Afrique. Les nains du Haut-Bomokandi. Par M. lieutenant R. Dubreucq.

East Africa. *Mem. S.G. Italiana* 8 (1898): 199–223. **Vannutelli and Citerni.**

La seconda spedizione Bòttego nell' Africa Orientale. Conferenza di L. Vannutelli e C. Citerni, con una breve introduzione di G. Roncagli.

Egypt. **Brown.**

The Land of Goshen and the Exodus. By Major R. H. Brown, C.M.G. London: E. Stanford, 1899. Size 9 × 6, pp. 86. *Maps and Illustrations. Price* 5*s. Presented by the Publisher.*

Major Brown tells the story of the Israelites in the land of Goshen and their exodus in the light of the topography of the region, with which he is minutely acquainted, and by the aid of the most recent Egyptian discoveries. He disclaims any special knowledge as an Egyptologist, and cites the standard works of recognized authorities for all subjects outside his personal knowledge.

Egypt. ——

Egypt. No. 3 (1899). Report by Her Majesty's Agent and Consul-General on the Finances, Administration, and Condition of Egypt and the Soudan in 1898. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. iv. and 54. *Price* 6*d.*

Egypt. *Globus* 75 (1899): 189-193. ——
Unter den Beduinen der ägyptischen Wüste. Von R. T. K. *With Illustrations.*

French Congo. *Mouvement G.* 16 (1899): 193-198. ——
Les concessions au Congo Français.

French Congo. *Questions Dipl. et Colon.* 6 (1899): 449-458. **Bourdarie.**
La Colonisation du Congo Français. Par P. Bourdarie.

On the political organization of the colony of French Congo and the regulations affecting its development.

French Congo. *C. Rd. S.G. Paris* (1898): 355-359. **Bouysson.**
Renseignements sur la région côtière au nord de Libreville et sur le bas Ogôoué. Par M. J. Bouysson. *With Map.*

French Guinea. *C. Rd. S.G. Paris* (1899): 1-4. **Salesses.**
Le chemin de fer de Conakry au Niger navigable. Por le capitaine Salesses.

French Niger Territory. *Scottish G. Mag.* 15 (1899): 186-200. ——
The French Niger Territory.

French West Africa. *C. Rd. S.G. Paris* (1899): 12-15. **Blondiaux.**
Boucle du Niger.—Mission Blondiaux.

French West Africa. *C. Rd. S.G. Paris* (1898): 421-455. **Gentil.**
Réception de M. Émile Gentil Administrateur Colonial de l'Oubangui au Lac Tchad. *With Illustrations and Map.*

German East Africa. *B.S.G. Italiana* 12 (1899): 108-116. **Pestalozza.**
Notizie sull' Africa Orientale Tedesca, del socio cav. Giulio Pestalozza.

A report from the Italian consul in Zanzibar.

German East Africa—Kilimanjaro. *G.Z.* 5 (1899): 209-226. **Meyer.**
Die Gletscher des Kilimandjaro. Von Dr. Hans Meyer. *With Illustrations.*

Madagascar. ——
France. No. 1 (1899). Further Correspondence with the French Government respecting Madagascar. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. iv. and 58. *Price* 6*d.*

Madagascar. *C. Rd.* 128 (1899): 716-718. **Colin.**
Observations astronomiques et magnétiques faites sur la côte occidentale de Madagascar. Note du R. P. Colin.

Madagascar. *C. Rd. S.G. Paris* (1899): 16-33. **Jogan.**
Madagascar en 1898. Par Raymond Jogan.

Mauritius. **Anderson.**
The Sugar Industry of Mauritius. By James Forrester Anderson. Paper read at a meeting of the Royal Colonial Institute, December 13, 1898. (From the *International Sugar Journal*, April 1, 1899.) Size 8½ × 5½, pp. 172-184. *Presented by the Author.*

Portuguese East Africa. **McMaster.**
Trade of Beira for the year 1898. Foreign Office, Annual No. 2218, 1899. Size 10 × 6½, pp. 14. *Price* 1*d.*

St. Helena. *Imp. and Asiatic Quarterly Rev.* 7 (1899): 345-352. **Sterndale.**
St. Helena in ye olden tyme. By his Excellency R. A. Sterndale, Governor of St. Helena.

Somaliland. *B.S.G. Paris* 19 (1898): 432-488. **Poncins.**
Voyage au Choa, explorations au Somal et chez les Danakils. Par le Vicomte Edmond de Poncins. *With Map.*

South Africa—Great Fish Bay. *Ann. Hydrographie* 27 (1899): 100-102. ——
Von der deutschen Tiefsee-Expedition.

Description of Great Fish Bay and Tiger Peninsula from the *Valdivia.*

South Africa—Native life. *Globus* 75 (1899): 268-271. ——
Middlebrooks Photographieen aus dem Leben der Zulukaffern. *With Illustrations.*

Transvaal—Swaziland. *Geolog. Mag.* 6 (1899): 105-111. **Jones.**
Notes on the Geology of West Swaziland. South Africa. By Prof. T. Rupert Jones, F.R.S. *With Plan and Sections.*

Uganda. —

Africa. No. 4 (1899). Papers relating to Events in the Uganda Protectorate and Lieut.-Colonel Macdonald's Expedition. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. 34. *Price* 3½*d.*

Uganda. *Imp. and Asiatic Quarterly Rev.* 7 (1899): 322–337. **Bourne**

The Uganda Protectorate and its Relation to the Sudan. By H. R. Fox Bourne.

Uganda. *J. United Service I. India* 28 (1899): 25–33. **Vaughan.**

From the Punjab Frontiers to Uganda. By Lieut. E. G. Vaughan.

Western Sudan. *Ann. G.* 8 (1899): 176–179. **Meyer—Schirmer.**

Histoire de la découverte et de la formation des États du Soudan occidental, d'après M. P. Const. Meyer. Par M. H. Schirmer.

NORTH AMERICA.

American Fishes. **Jordan and Evermann.**

B.U.S. National Museum, No. 47, Pts. ii. and iii. (1898): 1241–3136.

The Fishes of North and Middle America: A descriptive Catalogue of the Species of Fish-like Vertebrates found in the Waters of North America, North of the Isthmus of Panama. By D. S. Jordan and B. W. Evermann.

Canada. *Travel* 3 (1899): 559–564. **Taylor.**

Up the Mackenzie River to the Polar Sea. A Lady's Journey in Arctic America. By Miss Elizabeth R. Taylor. *With Map and Illustrations.*

Canada. *Scottish G. Mag.* 15 (1899): 126–138. **Tyrrell.**

Natural Resources of the Barren Lands of Canada. By J. B. Tyrrell, M.A., &c. *With Illustrations.*

Canada—British Columbia. **Penck.**

Z. Deutsch. u. Österreich. Alpenv. 29 (1898): 55–60.

Der Illecillewaetgletscher im Selkirkgebirge. Von Albrecht Penck. *With Illustrations.* Also separate copy. *Presented by the Author.*

Canada—British Columbia. *P. and T.R.S. Canada* 3 (1897): 91–112. **Campbell.**

The Origin of the Haidahs of the Queen Charlotte Islands. By John Campbell, LL.D.

Calls attention to the Melanesian character of the Haidah language.

Canada—British Columbia. *P. and T.R.S. Canada* 3 (1897): 85–90. **Hill-Tout.**

Notes on the Cosmogony and History of the Squamish Indians of British Columbia. By Prof. C. Hill-Tout.

Points out that fifty per cent. of the words of the Dené Indian vocabulary are pure archaic Chinese roots.

Canada—Geological Survey. —

Summary Report of the Geological Survey Department for the year 1898. Ottawa, 1899. Size 10 × 6½, pp. 208.

Canada—Historical. *P. and T.R.S. Canada* 3 (1897): 3–38. **Bourinot.**

Canada during the Victorian Era: a Historical Review. By J. G. Bourinot, C.M.G., &c. *With Map and Illustrations.*

Canada—Labrador. *B.S.R.G. d'Anvers* 22 (1899): 283–295. **Richet.**

Rapport sur un projet d'expédition au Labrador. Par M. Étienne Richet.

Plan of a projected journey of exploration in the interior of Labrador.

Canada—New Brunswick. *P. and T.R.S. Canada* 3 (1897): 131–163. **Ganong.**

Upon Raised Peat-Bogs in the Province of New Brunswick. By W. F. Ganong. *With Maps and Diagrams.*

Canada—N.W.T. *B.S. Neuchateloise G.* 11 (1899): 176–195. **Petitot.**

De Carlton-House au Fort Pitt (Saskatchewan). Par Émile Petitot.

Canada—Rocky Mountains. *Alpine J.* 19 (1899): 441–466. **Collie.**

Climbing in the Canadian Rocky Mountains. By J. Norman Collie, F.R.S. *With Illustrations.*

Canada—Saskatchewan. *National G. Mag.* **10** (1899): 113–134. **Wilcox.**
Sources of the Saskatchewan. By Walter D. Wilcox. *With Sketch-map and Illustrations.*

Canada—Yukon District. *Questions Dipl. et Colon.* **6** (1899): 355–365. **Lamare.**
Au Klondyke. Par E. Janne de Lamare. *With Map.*

Canada—Yukon District. *Ymer* **19** (1899): 81–105. **Nordenskjöld.**
En expedition till Klondike och Yukon-territoriet sommaren 1898. Af Otto Nordenskjöld. *With Maps and Illustrations.*

Canada—Yukon District. *J.R. Colonial I.* **30** (1899): 227–235. **Shaw.**
Klondike. By Miss Flora L. Shaw—Discussion.

Mexico. **Wright.**
Picturesque Mexico. By Marie Robinson Wright. London: J. B. Lippincott Co. [1897]. Size 13 × 10½, pp. 446. *Illustrations. Presented by the Publishers.*

This is the outcome of a long visit to Mexico by an American journalist, who specially devoted himself to seeing the interesting features of the republic both in natural scenery and national life.

Mexico—Yucatan. **Peirce.**
Trade of Yucatan for the year 1898. Foreign Office, Annual No. 2208, 1899. Size 10 × 6½, pp. 10. *Price* 1*d.*

United States—California. *Sierra Club B.* **2** (1899): 270–277. **Bradley.**
Exploration of the East Creek Amphitheater. By Cornelius Beach Bradley. *With Map and Plate.*

United States—California. *Sierra Club B.* **2** (1899): 278–283. **Hutchinson.**
A neglected region of the Sierra. By Lincoln Hutchinson. *With Map and Plates.*

United States—Florida. **Willoughby.**
Across the Everglades. A Canoe Journey of Exploration. By Hugh L. Willoughby. London: J. M. Dent & Co., 1898. Size 8 × 5½, pp. 192. *Maps and Illustrations. Presented by the Publishers.*

The record of a yachting and canoe voyage along the coast of Florida and through the inland waters of the almost unexplored Everglades.

United States—Historical. *National G. Mag.* **10** (1899): 73–92. **Hill.**
The Original Territory of the United States. By Hon. David J. Hill, LL.D.

The paper recounts the circumstances of the growth of the Eastern colonies of America, and their consolidation into the United States.

United States—Mississippi. *J. Franklin I.* **147** (1899): 297–308. **Haupt.**
The Problem of the Mississippi. By Herman Haupt.

On various possible methods of regulating the Mississippi so as to prevent destructive floods in its lower course.

United States—New Orleans. **Vansittart.**
Trade of New Orleans and District for the year 1898. Foreign Office, Annual No. 2206, 899. Size 9½ × 6½, pp. 28. *Price* 2*d.*

United States—New York. *American J. Sci.* **7** (1899): 249–263. **Fairchild.**
Glacial Lakes, Newberry, Warren, and Dana, in Central New York. By H. L. Fairchild. *With Maps.*

United States—New York. *B. American G.S.* **31** (1899): 1–23. **Tarr.**
Physical Geography of New York State. By R. S. Tarr. *With Illustrations.*

This instalment deals with the lakes and swamps of New York State.

CENTRAL AND SOUTH AMERICA.

Argentina. *B.S. Neuchateloise G.* 11 (1899): 214–252. **Beck-Bernard.**
Missions Franciscaines du désert argentin. Par Madame Lina Beck-Bernard.

Brazil. **Beaumont.**
A Journey to the Diamond Fields of Minas Geraes, and Remarks on the Province of Minas Geraes. Foreign Office, Miscellaneous, No. 494. 1899. Size 10 × 6. pp. 30. *Price* 2*d.*

This is noticed in the *Journal* for June (vol. xiii. p. 661).

Brazil. **Maldonado-Ulloa.**
Relación de la Jornada y Descubrimiento del Rio Mana (hoy Madre de Dios) por Juan Álvarez Maldonado en 1567. Publícala Luís Ulloa. Sevilla, 1899. Size 8¾ × 6½, pp. xxiv. and 54. *Map. Presented by M. Luis Ulloa.*

Brazil. *B.S. Languedoc G.* **21** (1898): 343–368. **Viala.**
Considérations économiques sur le Brésil. Par L. Fernand Viala.

Describes a journey to the north-west of Rio de Janeiro and the resources of the country.

Brazil—Exploration. *Rev. Trim. I. G. e Hist. Bahia* **5** (1898): 524–541. **Argollo.**
As explorações do Sr. Apolinario Frot, pelo Dr. Miguel de Teive e Argollo.

Central American Canals. *Petermanns M.* **45** (1899): 42–43. **Polakowsky.**
Vom Nicaragua-Kanal. Vom Panama-Kanal. Von Dr. H. Polakowsky.

Chile. *Z. Ges. Erdk. Berlin* **33** (1898): 393–399. **Philippi.**
Einige Worte über den unrichtigen Gebrauch des Wortes "Cordillera" in Chile. Von Dr. R. A. Philippi.

South America. **Brinton.**
On Two unclassified recent Vocabularies from South America. By Daniel G. Brinton, M.D. (Reprinted from *Proc. Amer. Philos. Soc.*, vol. xxxvii., No. 158.) 1898. Size 9½ × 6, pp. 4. *Presented by the Author.*

South America. **Frick.**
The Vassalage of South America. By John Frick. London, [1898]. Size 10½ × 8¼, pp. 52. *Presented by the Author.*

On the financial relations of the South American republics.

South America—Gran Chaco. *Ymer* **19** (1899): 45–79. **Lindman.**
Några bilder från den sydamerikanska vildmarken El gran chaco. Af C. A. M. Lindman. *With Map and Illustrations.*

Venezuela. *Globus* **75** (1899): 177–180. **Sievers.**
Richard Ludwigs Reisen in Coro (Venezuela). Von W. Sievers.

West Indies. ———
West Indies. Correspondence relating to the Hurricane on September 10–12, 1898, and the Relief of Distress caused thereby. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. xii. and 132. *Price* 1*s*. 2*d*.

West Indies. **Fiske.**
The West Indies. A History of the Islands of the West Indian Archipelago, together with an Account of their Physical Characteristics, Natural Resources, and Present Condition. By Amos Kidder Fiske. New York and London: G. P. Putnam's Sons, 1899. Size 8¼ × 5½, pp. xii. and 414. *Map and Illustrations. Price* 6*s*. *Presented by the Publishers.*

This little volume is prepared to meet the demand in America for authentic information as to the whole group of the West Indies, and it fulfils the promise of its title-page with a due regard to proportion and a readable conciseness.

AUSTRALASIA AND PACIFIC ISLANDS.

New South Wales. ———
New South Wales. Seventeenth Annual Report of the Department of Lands, being for the year 1896. Sydney, 1897. Size 13¼ × 8¼, pp. iv. and 106. *Maps and Plans. Presented by the Agent-General for New South Wales.*

New South Wales. ———
Annual Report of the Department of Mines and Agriculture, New South Wales, for the year 1897. Sydney, 1898. Size 13½ × 8½, pp. 216. *Plans. Presented by the Agent-General for New South Wales.*

New South Wales. **Watt.**
New South Wales. Department of Mines and Agriculture. Geological Survey. Mineral Resources. No. 4. Notes on the Occurrence of Bismuth Ores in New South Wales. By J. A. Watt, M.A., B.SC. Sydney, 1898. Size 9½ × 6¼, pp. 12.

Queensland. ———
Report of the Surveyor-General for the year ending December 31, 1896. Brisbane. Size 13½ × 8½, pp. 18. *Plans.*

The Report contains a map showing the present position of the survey of Queensland, and plans showing the progress of the re-survey of Brisbane.

Queensland. *P. and I. Queensland Br. R.G.S. Australasia* **13** (1899): 1–12. **Collins.**
Early Explorations on the Logan, and the ascent of Mount Lindesay by Captain Logan in 1828. By R. M. Collins.

Queensland. **Skertchly.**
On the Geology of the country round Stanthorpe and Warwick, South Queensland, with especial reference to the Tin and Gold Fields and the Silver Deposits. By Sydney B. J. Skertchly. Brisbane: 1898. Size 13½ × 8½, pp. 98. *Maps.*

Samoa. *Globus* **75** (1899): 185–189. **Krämer.**
Die samoanische Königsfrage im Hinblick auf die letzten Ereignisse zu Apia. Von Dr. Augustin Krämer. *With Sketch-Map.*

Samoa. *Fortnightly Rev.* **65** (1899): 723–734. **Leigh.**
The Samoan Crisis and its Causes. By John George Leigh.

Solomon Islands. **Giglioli.**
Gli ultimi giorni dell' epoca della pietra Melanesia. Scettro o mazza con testa litica di singolare bellezza da Saa, Malanta, isole Salomone. Nota del prof. Enrico H. Giglioli. (Estratto dall' *Archivio per l'Antropologia e l'Etnologia*, vol. xxviii., Fasc. 2°—1898.) Size 10 × 6½, pp. 4. *Presented by the Author.*

South Australia. *J.R. Colonial I.* **30** (1899): 314–343. **Cockburn.**
South Australia as a Federal Unit. By Hon. J. A. Cockburn, M.D.

POLAR REGIONS.

Franz Josef Land. **Jackson.**
A Thousand Days in the Arctic. By Frederick G. Jackson. With Preface by Admiral Sir F. Leopold McClintock, K.C.B., F.R.S. Illustrated from Photographs by the Author and Drawings by R. W. Macbeth, A.R.A., Clifford Carlton, Harry C. Edwards, and F. W. Frohawk, from data furnished by the Author. With Five Original Maps. 2 vols. London and New York: Harper & Bros., 1899. Size 10 × 6½, pp. (vol. i.) xxii. and 552; (vol. ii.) xvi. and 580. *Price* 32*s.* *Presented by the Publishers.*

Mr. Jackson gives a full and richly illustrated account of the Jackson-Harmsworth expedition in Franz Josef Land, mainly in the form of a diary of the occurrences from day to day, which furnishes a vivid picture of the hard conditions of life and the difficulties in the way of work which were successfully overcome. A list of the game killed in Franz Josef Land is introduced, and there is a supplementary chapter on scurvy, including "An experimental inquiry into scurvy," by Prof. Vaughan Harley. An important appendix contains a summary of the scientific results, including a description of the birds' eggs by Mr. F. W. Frohawk, notes on the birds by Mr. Jackson, a summary of the botany by Mr. Fisher, and of the meteorological observations by Mr. Armitage, together with a discussion of the meteorological results by Mr. Strachan, of the Meteorological Office. Dr. Koettlitz and Messrs. Newton and Teall describe the geology, and various tables of magnetic, tidal, and other observations are given. There is a full index. A series of excellent maps shows how greatly the topography of Franz Josef Land has been elucidated by the expedition.

MATHEMATICAL GEOGRAPHY.

Angular Divisions. *B.S.G. Lille* **29** (1898): 244–275. **Tilmant.**
Mémoire contre la division du cercle en 400 grades et en faveur de l'adoption du système de 240 degrès. Par M. V. Tilmant.

Cartography. **Zöppritz and Bludau.**
Leitfaden der Kartenentwurfslehre. Für studierende der Erdkunde und deren Lehrer bearbeitet von Prof. Dr. Karl Zöppritz. In zweiter neubearbeiteter und erweiterter Auflage herausgegeben von Dr. Alois Bludau. Erster Teil: Die Projektionslehre. Leipzig: B. G. Teubner, 1899. Size 10 × 7, pp. x. and 178. *Presented by the Publisher.*

Map Representations. *M.G. Ges. Wien* **42** (1899): 19–24. **Heiderich.**
Schattenplastik und Farbenplastik. Von Prof. Dr. F. Heiderich.

A criticism of Dr. Peucker's 'Kartographische Studien.'

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Biogeography—Migration. **Van der Broeck.**

Le discours de M. Ed. Dupont à la séance publique du 16 décembre 1898 de l'Académie des sciences de Belgique, consacré à l'évolution, et au phénomène de la Migration. Étude critique. Par Ernest Van den Broeck. Extrait des Annales (Bulletin des séances) de la Société royale Malacologique de Belgique. Tome xxxiv. (1899).—Séance du 4 février 1899, pp. xi. à xxiv. Size 9½ × 6½. *Presented by the Author.*

Geophysics. *Science* 9 (1899): 665–674, 704–711. **Kelvin.**

The Age of the Earth as an Abode fitted for Life. By Lord Kelvin.

Glacial Action. *M.G. Ges. Hamburg* 15 (1899): 67–130. **Petersen.**

Geschiebestudien. Beiträge zur Kenntniss der Bewegungsrichtungen des diluvialen Inlandeises. Von Dr. Johannes Petersen. Erster Theil: 1, Basalt von Schonen; 2, Cancrinit-Aegirinsyenite von Särna; 3, Gesteine der Diabas-Familie. *With Map.*

A study of the erratic blocks transported by the glaciers of the great Ice Age.

Oceanography—Adriatic. **Riccò and Saija.**
Atti R.A. Lincei, Rendiconti 7 (1898): 339–344.

Osservazioni di temperatura e del colore delle acque fatte nell' Adriatico e nel Jonio. Nota riassuntiva di A. Riccò e G. Saija.

Oceanography—Pacific. *C. Rd. S.G. Paris* (1899): 79–80. **Girard.**

Température et densité de l'océan Pacifique et de la mer de Behring. Par Jules Girard.

Rivers. *J. Franklin I.* 147 (1899): 177–197. **Hazen.**

The Clarification of River Waters. By Allen Hazen.

Tides. **Moxly.**

The Tides simply explained, with practical hints to Mariners. By the Rev. J. H. S. Moxly. London: Rivingtons, 1899. Size 8 × 5½, pp. viii. and 152. *Price 5s. Presented by the Publisher.*

Mr. Moxly's objects in preparing this book are (1) to show that "tide-experts" have been misled into endeavouring to make the facts of nature fit their theory; and (2) to put forward a theory of the tide which explains the observed facts. The first chapter is devoted to the fallacies occurring in standard treatises on the tides. The later chapters combat the views of Prof. G. H. Darwin, Sir Robert Ball, Lord Kelvin, and the late Sir George Airy, and contain the description of the "equilibrium theory" put forward by the author in opposition to the "dynamical theory" of the mathematicians.

Zoogeography. **Palacký.**

Zemépisné rozšíření želv. (The geographical distribution of turtles.) Napsal Dr. Jan Palacký. ("Věstník České Akademie císaře Františka Josefa pro vědy, slovesnost a umění." Roč. vi., 1897. Prague.) Size 11½ × 7, pp. 18. *Presented by the Author.*

Zoogeography. **Palacký.**

Die Verbreitung der Batrachier auf der Erde. Von Prof. Dr. J. Palacký. (Aus den Verhandlungen der k. k. zoologisch-botanischen Gesellschaft in Wien [Jahrgang 1898] besonders abgedruckt.) Size 9 × 6, pp. 10. *Presented by the Author.*

Zoogeography. **Palacký.**

La distribution des Ophidiens sur le Globe. Par J. Palacký. (Extrait des Mémoires de la Société Zoologique de France, tome xi. pp. 88–125, année 1898.) Paris. Size 10 × 6½. *Presented by the Author.*

Zoogeography. **Palacký.**

Die Verbreitung der Salamandriden. Von Prof. Dr. J. Palacký. (Sitzungsberichte der königl. böhmischen Gesellschaft der Wissenschaften. Mathematisch-naturwissenschaftliche Classe. 1898. XXXV.) Prag, 1898. Size 10 × 6, pp. 8. *Presented by the Author.*

Zoogeography. **Sclater.**

The Geography of Mammals. By William Lutley Sclater and Philip Lutley Sclater, PH.D., F.R.S. London: Paul & Co., 1899. Size 9½ × 6, pp. xviii. and 336.

Maps and Illustrations. Price 12*s*. *Two copies, one presented by the Authors, the other by the Publishers.*

In addition to seven chapters by Mr. W. L. Sclater, which have already been published in the *Geographical Journal*, this volume contains a paper by Dr. P. L. Sclater on the distribution of marine mammals. The seven remaining chapters have not previously been published, and deal respectively with the distribution of the monkeys and lemurs, the carnivora, the insectivores, bats and rodents, hyraxes, elephants and ungulates, cetaceans and sirenians, edentates, and finally marsupials and monotremes.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. **Ratzel.**

Anthropogeographie. Erster Teil: Grundzüge der Anwendung der Erdkunde auf die Geschichte. Von Dr. Friedrich Ratzel. Zweite Auflage. Stuttgart: J. Engelhorn, 1899. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. xviii and 604. *Presented by the Author.*

This new edition of Prof. Ratzel's famous work will be welcomed by all geographical students. In addition to the complete revision and rearrangement necessitated by the seventeen years which have elapsed since the first edition appeared, there is a valuable list of important writings on anthropogeography. The new edition is 100 pages longer than the old.

Anthropology. **Keane.**

Man, Past and Present. By A. H. Keane. Cambridge: University Press, 1899. Size $8 \times 5\frac{1}{2}$, pp. xii. and 584. *Illustrations. Price* 12*s*. *Presented by the Publishers.*

This important work is intended as a supplement to the author's 'Ethnology.' It deals systematically with the primary divisions of mankind, taking up each group in turn, and the statements are fortified by an immense number of references, which the advanced student will find of the utmost service.

BIOGRAPHY.

Barbier. *B. Trim. S.G. de l'Est* (1898): 193-222. **Pfister.**

Joseph-Victor Barbier. Par Ch. Pfister. *With Portrait.*

Biographical Dictionary. **Lee.**

Dictionary of National Biography. Edited by Sidney Lee. Vol. lviii. Ubaldini.—Wakefield. London: Smith, Elder & Co., 1899. Size $10 \times 6\frac{1}{2}$, pp. vi. and 464. *Price* 15*s*.

The following names of geographical interest appear among the notices in this volume:—Captain George Vancouver, by Prof. J. K. Laughton; Francis Vernon, by G. Le Grys Norgate; Godfrey Thomas Vigne, by E. Irving Carlyle; William Vincent, by G. Le Grys Norgate; Armagil Waad or Wade, by A. F. Pollard; George Waddington, by W. P. Courtney; Lionel Wafer, by Prof. J. K. Laughton.

Coello, Barbier, Gebelin, Lièvre. **Drapeyron.**

B.S. Topographie France **22** (1898): 141-144.

Le Colonel F. Coello, J.-V. Barbier, J. Gebelin, and A.-F. Lièvre. Par L. Drapeyron.

Coello y Quesada. *Deutsche Rundschau G.* **21** (1899): 328-330. ———

D. Francisco Coello de Portugal y Quesada. *With Portrait.*

Dufresne. *B.S.G. Genève* **38** (1899): 91-94. **Chaix.**

Le Dr. Edouard Dufresne, ancien Président de la Société de Géographie de Genève, 1818-1898. Par E. Chaix.

GENERAL.

Ballooning. *Meteorolog. Z.* **16** (1899): 49-58. **Hergesell.**

Ergebnisse der internationalen Ballonfahrten. Von H. Hergesell. *With Diagrams.*

British Colonies. **Zimmermann.**

Die Europäischen Kolonien. Dritter Band. Die Kolonialpolitik Grossbritanniens. Zweiter Theil. Vom Abfall der Vereinigten Staaten bis zur Gegenwart. Von Dr. Alfred Zimmermann. Berlin: E. S. Mittler und Sohn, 1899. Size $9\frac{1}{2} \times 6$, pp. xiv. and 408.

Cosmogony. **Duponchel.**
B.S. Languedoc G. **19** (1896): 455; **20** (1897): 204, 363, 477; **21** (1898): 227, 369.
Nouvelle théorie cosmogonique. Par M. A. Duponchel.

Former instalments of this treatise are noted in the *Journal* for June, 1897, ix. p. 689.

Education in Germany. *Petermanns M.* **45** (1899): 91–94. ———
Der geographische Unterricht an den deutschen Hochschulen im Sommersemester 1899.

Travel. **Taylor.**
Vacation Days in Hawaii and Japan. By Charles M. Taylor, Jr. Philadelphia: G. W. Jacobs & Co., 1898. Size 8½ × 6, pp. 362. *Illustrations. Presented by the Author.*

A brightly written and neatly illustrated record of a holiday trip.

Tropical Diseases. **Crosse.**
The Treatment of Malaria and Blackwater Fever. A Paper read before the Physical Society on Monday, October 3, 1898. By W. H. Crosse. London: Ash & Co., 1898. Size 6½ × 4, pp. 24. *Presented by the Author.*

The author strongly upholds the use of quinine in blackwater fever, and denies the truth of Dr. Koch's view that this type of fever is a result of quinine-poisoning.

Zoogeographical Classification. **Harvie-Brown.**
On a Correct Colour Code, or Sortation Code in Colours, to serve for mapping the Zoogeographical Regions and Sub-Regions of the World, and also to be of use as an Eye-Index for Librarians. By J. A. Harvie-Brown. (Extracted from the 'Proceedings of the International Congress of Zoology,' Cambridge, 1898.) Size 10 × 6½, pp. [4].

A scheme of classification by the use of coloured cards, a different colour being used for each of the recognized faunal realms.

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**
Publications issued since May 8, 1899.

1-inch—General Maps:—

ENGLAND AND WALES:—93, 119, 136, 142, 150, 157, 158, 165, 169, engraved in outline (revision). 1*s. each.*

6-inch—County Maps:—

ENGLAND AND WALES (revision):—**Derbyshire**, 7 S.W. **Durham**, 9 S.W., 16 N.W., 30A S.E., 38 N.W., 51 N.E., N.W. **Hertfordshire**, 8 complete, 9 N.W., S.W., S.E., 11 S.E., 12 S.W., S.E., 13 S.W., S.E., 14 N.W., N.E., 15 N.W., 14 S.E. and 15 S.W., 19 N.E., S.E., 20 complete, 21 complete, 22 S.E., 23 N.W., 26 N.E., S.E., 27 complete, 28 complete, 29 N.W., N.E., 30 N.W., S.W., 31 N.W., N.E., S.W., 33 N.E., S.E., 34 complete, 35 complete, 36 complete, 37 N.W., N.E., S.W., 38 N.E., S.W., S.E., 39 complete, 41 N.E., 42 N.W. **Northumberland**, 5 S.E., 8A S.E., 9 S.W., 17 S.W., S.E., 18 N.W., S.E., 28 N.W., N.E., 28A S.E., 32 S.W., 40 N.W., S.E., 48 N.E., S.E., 57 N.E., 82 N.W., 89 S.E., 105 S.W., 108 S.E., 109 S.W. **Sussex**, 10 N.W., 61 S.W., 64 S.E., 72 S.E., 73 S.W., 76 N.W., 81 N.W. 1*s. each.*

25-inch—Parish Maps:—

ENGLAND AND WALES (revision):—**Berkshire**, IV. 13, 14; V. 3, 9, 10, 11, 13, 14, 15, 16; VII. 4, 7; VIII. 1, 15; X. 5; XXVIII. 8; XXX. 10, 15; XXXI. 10, 13, 15, 16; XXXIX. 1, 2, 3, 4, 5; XLI. 5, 6. **Bucks.**, XXXIV. 15; XXXVIII. 2; XXXIV. 15; LVIII. 4. **Cheshire**, VII. 3 and 7, 11, 13, 14; XIII. 2, 6, 8; XXII. 5; XXXVII. 5; XXXVIII. 12, 14, 15, 16; XLV. 8; XLVI. 9, 13; LIII. 11; LVII. 12; LVIII. 2, 5; LXIII. 1, 2, 5, 13; LXVII. 1. **Cumberland**, XLII. 14; LXIII. 14; LXIV. 15, 16; LXVIII. 6; LXX. 1, 8, 9, 12; LXXII. 7. **Derbyshire**, XXVIII. 15; XXXIII. 3, 4; XXXIV. 7. **Denbighshire**, XX. 14; XXI. 3, 4, 8; XXII. 1, 9, 10; XXIX. 7, 8; XXXVI. 3. **Flint**, II. 2, 3, 7; V. 4, 6, 10, 11; IX. 11, 14, 16; X. 13; XI. 13; XIII. 16; XIV. 2, 7, 8, 9, 10, 11, 12, 13, 15, 16; XV. 5, 9, 13; XVI.

8, 12; XVII. 2, 3, 4, 6, 8, 9; XVIIA. 1, 9; XXII. 3; XXIII. 11; XXV. 7, 8, 12. **Glamorganshire**, X. 5, 6, 10, 13; XVI. 2, 14, 15; XXV. 2, 3, 4, 7, 9; XXVI. 2, 3, 6, 7, 10; XXXIX. 8, 12, 15; XLIV. 2, 3, 6. 7, 8, 10, 11. **Notts.**, I. 11, 14, 15; II. 8, 12, 16; III. 1, 2, 3, 5 and 9, 6, 7, 10, 11, 12, 13, 14, 16; IV. 6, 7, 9, 10, 12; V. 3; XXVII. 7. **Oxfordshire**, XXX. 7, 8, 11, 12, 15, 16; XXXI. 1, 2, 3, 5, 6, 9, 10, 11, 13, 14, 15; XXXII. 6, 7; XXXVI. 3, 4, 7, 11, 12, 16; XXXVII. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14; XXXVIII. 2, 3, 6, 7, 9, 10, 11, 13, 15; XLIII. 4; XLIV. 1; XLV. 15; XLVI. 5; LV. 8. **Staffordshire**, III. 12; VII. 7, 12; VIII. 3; IX. 13; XIII. 14; XIV. 5, 9. **Sussex**, XVI. 13; XXVII. 3, 7, 11, 15; XL. 3, 4, 5, 6, 7, 8, 9, 11, 13; LIV. 1, 3, 4, 7, 8, 11, 12, 15, 16; LV. 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 15, 16; LVI. 1, 2, 3, 5, 7, 8, 9, 10, 11, 12, 14, 15; LVII. 5; LIX. 1, 2, 3, 5, 6; LXVII. 5, 7; LXVIII. 2, 4, 6, 9, 10, 12; LXX. 3. *3s. each.*

(*E. Stanford, Agent.*)

Balkan Peninsula. **Mach.**

Karte der Schulsphären der türkischen Balkan-Halbinsel. Entworfen und gezeichnet von Richard von Mach. Scale 1 : 3,700,000 or 58·4 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1899, Tafel 8. Gotha: Justus Perthes, 1899. *Presented by the Publisher.*

Cerigo Island. **Leonhard.**

Originalkarte der Insel Kythera (Cerigo). Auf Grund der englischen Küstenaufnahme und eigener Beobachtung entworfen und gezeichnet von Dr. R. Leonhard. Scale 1 : 100,000 or 1·6 stat. mile to an inch. *Petermanns Geographische Mitteilungen*, Ergänzungsheft No. 128. Gotha: Justus Perthes, 1899. *Presented by the Publisher.*

Historical Atlas. **Poole.**

Historical Atlas of Modern Europe, from the Decline of the Roman Empire; comprising also maps of parts of Asia and of the New World connected with European History. Edited by Reginald Lane Poole, M.A., PH.D., Fellow of Magdalen College, and Lecturer in Diplomatic in the University of Oxford. Part xxii. Oxford: The Clarendon Press; London, Edinburgh, Glasgow, and New York: Henry Frowde, M.A.; Edinburgh: W. & A. K. Johnston. 1899. *Price 3s. 6d. each part. Presented by the Clarendon Press.*

This part contains Maps 11 and 12, Central Europe, 1795–1810, by H. A. L. Fisher, M.A.; Map 75, The Four Eastern Patriarchates, by E. W. Brooks, M.A. Each of these maps is accompanied by explanatory letterpress.

ASIA.

China. **China Inland Mission.**

Map of China, prepared for the China Inland Mission, 1898. Scale 1 : 3,168,000 or 50 stat. miles to an inch. By permission of E. Bretschneider. London: E. Stanford, 1899. 4 sheets. *Price 10s.*

This map has been produced, by permission, from Bretschneider's Map of China. The positions of the stations of the China Inland Mission, as well as those of other Protestant missions, are indicated; the importance of each city or town is shown by the symbol employed to mark its position; and all the principal roads, as well as the few existing railways, are laid down.

AFRICA.

Central Africa. **Foà.**

Traversée de l'Afrique Équatoriale du Zambèze au Congo Français par Edouard Foà, chargè de Missions par Mr. le Ministre de l'Instruction publique. Août 1894—Novembre 1897. Scale 1 : 7,500,000 or 102 stat. miles to an inch. Paris: J. Hansen, 1899. *Presented by the Author.*

AMERICA.

Canada. **Dawson.**

Geological Survey of Canada. Scale 1 : 253,440 or 4 stat. miles to an inch. Shuswap Sheet. No. 11, British Columbia. G. M. Dawson. 1899. Geological Survey of Canada. *Presented by the Geological Survey of Canada.*

The geological survey of this district is published on two sheets, on one of which the topographical features and economic minerals are shown; the other is geologically coloured, explanatory notes being given on the margin. Roads, pack-trails, and exploratory routes are shown on both sheets; heights above sea-level are given in feet; and contours are drawn at vertical intervals of 250 feet.

AUSTRALIA.

Australia. **Bartholomew.**

Reduced Survey Map of Australia. Scale 1 : 6,000,000 or 95 stat. miles to an inch. By J. G. Bartholomew, F.R.G.S. Edinburgh : J. Bartholomew & Co., 1899. *Presented by the Publishers.*

Australia. **Muller.**

Remarkable maps of the XVth, XVIth, and XVIIth Centuries; reproduced in their original size. II.–III. (Supplement). Huych Allardt's Map of India (the part delineating Australia). With notes by J. E. Heeres, LL.D. Professor at the Dutch Colonial Institute, Delft. Amsterdam : Frederik Muller & Co. (F. Adama van Scheltema and Anton Mensing), 1899.

This is a supplementary map to Parts II. and III. of the series of 'Remarkable Maps of the XVth, XVIth, and XVIIth Centuries,' edited by the late Mr. C. H. Coote, and published by F. Muller & Co., Amsterdam. It is the part showing Australia, of Huych Allardt's Map of India. The date of this map is uncertain, but from information collected by Dr. J. E. Heeres, it appears to have been drawn between 1652 and 1653, and is certainly one of the earliest maps showing the results of Tasman's dis coveries. It has not been considered necessary to reproduce the whole of Allardt's map, as the remaining portion was not considered by Dr. Heeres to have any important bearing on the discovery of Australia. The map is accompanied by a sheet of explanatory letterpress.

Queensland. **Geological Survey Office, Brisbane.**

Geological Map of Charters Towers Goldfield. Scale 88 yds. to an inch. Geological lines by R. L. Jack, W. H. Rands, and A. Gibb Maitland. Topography by William Thompson, 1898. Geological Survey Office, Brisbane. 2nd edition, showing underground workings. 6 sheets. *Presented by R. L. Jack, Esq.*

GENERAL.

World. **Paris.**

Atlas Melin : Historique et Géographique. Spécialement établi pour les Cours de l'Enseignement Secondaire. No. 4. André Paris, Editeur à Moulins sur-Allier.

Part III. of this atlas was noticed in the *Geographical Journal*, May, 1897. That now issued, like those which have previously appeared, is divided into two sections, historical and geographical. It contains 120 maps and plans, and has been specially prepared for educational purposes.

Charts.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, March and April, 1899. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
3015 m	= 3·0	Scotland, west coast :—Loch na Keal. 1*s.* 6*d.*
2100 m	= 1·55	Channel islands :—Plateau des Minquiers. 1*s.* 6*d.*
3039 m	= var.	Novaya Zemlya :—Mali, Karmakulski, Stanovishiche, Gribovaya bay, Kostin strait. 1*s.* 6*d.*
3036 m	= 3·65	Balearic islands :—Head of Pollensa bay. 1*s.* 6*d.*
3024 m	= 3·9	Trinidad :—Serpent's mouth. 1*s.* 6*d.*
2427 m	= 2·7	United States, east coast :—Salem, Marblehead, and Beverly harbours and approaches. 1*s.* 6*d.*
539 m	= var.	Plans on the north and east coast of Brazil :—San João islands, San Aleixo island, Port Maceio, Benevente to Itapemirim, Benevente bay, channel and anchorage of the island of San Sebastiaõ (reproduction). 2*s.*
709 m	= 0·28	Sumatra, west coast :—Ujong Masang to Ujong Indrapura. 2*s.* 6*d.*
3030 m	= $\begin{Bmatrix}0·9\\9·0\end{Bmatrix}$	Bays and anchorages on the south coast of Java :—Wynkoops bay (Pelabuan Ratu bay), Chi Lauteureun bay. 1*s.* 6*d.*
3028 m	= $\begin{Bmatrix}1·45\\3·9\end{Bmatrix}$	Cochin China :—Kam ranh bay, Vung gang bay. 1*s.* 6*d.*
3026 m	= 0·38	China :—Macao to Pedro Blanco, including Hongkong. 2*s.* 6*d.*
3032 m	= 0·5	Upper Yang tse kiang :—Kwei chau fu to Chung king fu. 2*s.* 6*d.*
2921 m	= 0·5	Australia, east coast :—Claremont point to Cape Direction. 3*s.*
3045 d	= 2·5	Pacific ocean :—Enderbury island to Christmas island. 2*s.*
544		Brazil :—Santa Catherina strait :—Plan added, Aco cove.
1936		Islands in North Pacific ocean :—New plan, Clarion island.
608		Africa, west coast. River Gambia entrance :—Plan added, Bathurst.

No.	
2776 h.	River Niger:—Plans added, Tangbogi rapids, Buka passage, Moji passage.
2776 i.	River Niger:—Plan added, Bajibo anchorage.
1519	China, Si kiang or West river:—New plan, Sam shui reach.
2388	Sea of Okhotsk:—Plan added. Zabiyaka bay.
1037	Anchorages on the south-west coast of Australia:—Plan added, Barrack point anchorage.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
333	Mohawk bay.		
2427	Salem, Marblehead, and Beverly harbours.	New chart. Salem, Marblehead, and Beverly harbours	2427
1648	San João islands.	New chart. Plans on the north and east coasts of Brazil	539
1647	San Aleixo island.		
539	Port Maceio.		
2078	Benevente to Itapemirim.		
543	San Sebastião channel.		
709	Priaman to Ujong Indrapura.	New chart. Ujong Masang to Ujong Indrapura	709
1342	Plan of Vung gang bay on this chart.	New plan. Vung gang bay on this sheet	3028
2921	Claremont point to Cape Direction.	New chart. Claremont point to Cape Direction	2921

Charts that have received Important Corrections.

No. 1991, England, south coast:—Folkestone harbour. 1967, England, south coast:—Plymouth sound. 871, England, south coast:—Tamar river. 2260, Ports on the south coast of Norway. 2966, Arctic Russia:—Port Ekaterininskoi and Pala bay. 2751, Spitsbergen. 438, France, north coast:—Cape d'Alprech to Ambleteuse. 1623, Spain, west coast:—Cadiz harbour. 1805, France, south coast:—Cette to Marseille. 1233, Black sea:—Kustenjeh anchorage. 2233, Black sea:—Sevastopol to Kertch strait. 1074, Bermuda:—Approach to Grassy bay. 296, Newfoundland:—Cape Bonavista to Bay Bulls. 2902, Newfoundland:—Motion head to Flat rock point. 2490, United States, east coast:—Pemaquid point to Fletcher's neck. 2489, United States, east coast:—Nantucket sound and eastern approaches. 442, Cuba:—Guantanamo harbour. 443, Cuba:—Port of Santiago de Cuba. 1966, South America, north coast:—Tortuga to Cape La Vela. 959, British Honduras:—Approaches to Belize. 2002, Brazil:—Rio Grande do Sul. 2816, Central America, west coast:—Parida and Palenque anchorages. 538, British Columbia:—Seymour narrows, Menzies bay. 1722, Africa, west coast:—River Cacheo. 1724, Africa, west coast:—Bijouga islands, Sheet II. 1727, Africa, west coast:—Bijouga islands, Sheet III. 149, Africa, west coast:—Old Calabar river. 143, Red sea:—Jebel Teïr to Perim island. 22, Persian gulf:—Kuweit harbour. 826, India, west coast:—Karáchi to Vengurla. 830, Bay of Bengal:—Bassein river to Pulo Penang. 824, Bay of Bengal:—White point to Mergui. 825, Andaman islands. 2761, Sumatra, west coast:—Tyingkok bay to the strait of Sunda. 2597, Banka strait. 2195, Anchorages in the eastern part of Celebes. 2734, China, Si kiang or West river:—Sam chau to Chau sun. 1961, China sea:—Pescadores islands. 2823, China:—Wei hai wei harbour. 1260, China:—Chifu harbour. 2363, Tonga islands:—Tongatabu.

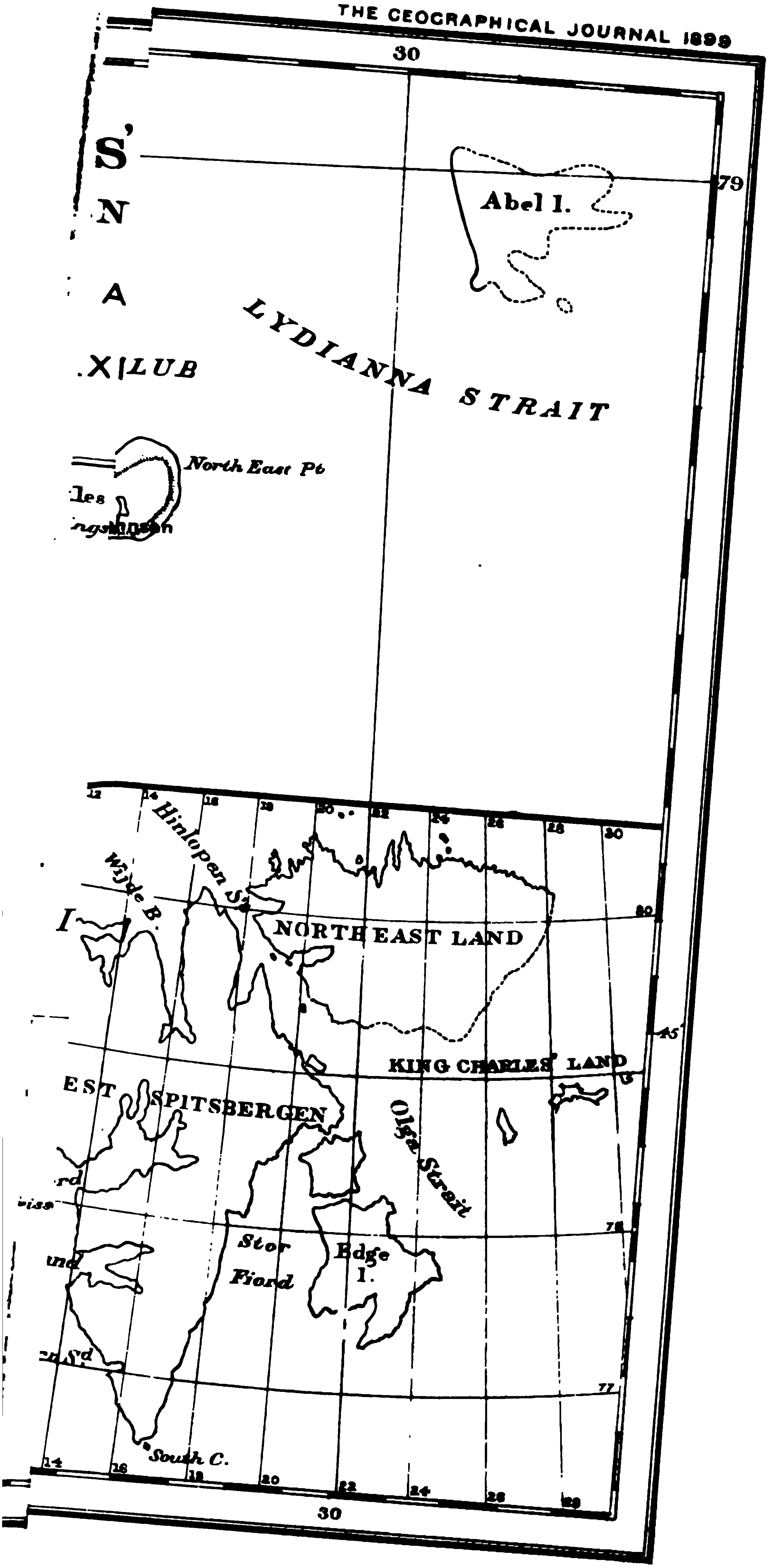
(*J. D. Potter, Agent.*)

United States Charts. **U.S. Hydrographic Office.**

Pilot Charts of the North Atlantic and North Pacific Oceans for June, 1899. Published at the Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.


THE GEOGRAPHICAL JOURNAL 1899
Abel I.
LYDIANNA STRAIT
North East Pt
Hinlopen St.
Wijde B.
NORTH EAST LAND
KING CHARLES LAND
SPITSBERGEN
Olga Strait
Stor Fiord
Edge I.
South C.

The

Geographical Journal.

No. 2. AUGUST, 1899. Vol. XIV.

JOURNEYS TO THE NORTH OF UGANDA.*

I.

By Colonel J. R. L. MACDONALD, R.E.

You are all aware that in June, 1897, the expedition which I had the honour to command left England for Mombasa to embark on its journey of exploration. The route into the interior from Mombasa was chosen because it allowed of our using for about 400 miles the existing railway and road facilities to Uganda; this left us only 200 miles of land communications to bring us to Lake Rudolf, which, running as it does nearly north and south, offered an excellent waterway, which we could make use of with comparatively few men by means of our steel boat. Thus from the fertile regions north of Lake Rudolf, which we meant to make our advanced base of operations, we had by this scheme only 200 miles of country to open out to enable us to maintain easy and safe communications with Mombasa and England.

Our European staff was to consist of ten or eleven officers, our escort of thirty Sikhs and three hundred Sudanese, and our transport of porters and carts to near the Ravine station on the Uganda road, and afterwards of porters and pack-animals.

In September, 1897, we arrived at Ngare Nyuki, one march from the Ravine, with our two thousand loads, and everything pointed to a successful start being made, as our arrangements had worked smoothly. Then, as you are aware, the expedition had for nine long months to abandon its own work in order to turn its whole strength in men and material to the assistance of the Uganda Protectorate, which was threatened with destruction by the revolt of the Sudanese troops.

* This and the following paper read at the Royal Geographical Society, June 12, 1899. Map, p. 240. For notes on the survey on which the map is based, see p. 202

The causes which led to this revolt it would be out of place for me to deal with in a paper such as this, and, moreover, they have been fully dealt with in the Commissioner's report. Nor will it be necessary for me to dwell on the military operations in Uganda otherwise than very briefly, in order that you may realize to some extent how much my expedition suffered, and against what difficulties it had to contend in its further operations.

You know that one garrison after another joined the mutineers until, on October 19, 1898, the rising tide of mutiny was stayed by our hard-won victory on Lubwa's hill, when with 17 Sikhs and 340 raw Swahilis we had to face nearly double the number of trained Sudanese. Then followed the weary investment of Lubwa's while reinforcements came up from the coast, and hardly had the first of these arrived when the escape of Mwanga from the Germans and the army of disaffected that sprang up like magic around him in the west claimed immediate attention and the division of our strength.

The defeat of Mwanga in January, 1898, on the borders of Koki was just in time to enable us to concentrate once more to meet the new crisis in the East, due to the masterly escape of the mutineers from Lubwa's. The offensive was taken against these mutineers, who were sharply defeated by my forces on February 19 at Kejembo, and followed up, surprised, and disastrously overthrown by Major Harrison at Kabagambe on February 24, successes which, coupled with the disarmament of Unyoro, compelled their flight into Wakedi country, east of the Nile.

This victory allowed of our turning our attention once more to Mwanga's following, which had again rallied and caused trouble in the west; and it was not till May 3, 1898, that I was able to hand over military charge and resume the reorganization of my own expedition, with the knowledge that the Protectorate, though it would have more fighting before it finally subdued its many enemies, was itself out of danger.

During this period of anxious struggle the expedition had done more than its share of fighting, having taken part in some twenty-four fights, and lost 18 per cent. in killed and wounded, or 73 men out of the 400 engaged. Indeed, up to the end of February, 1898, some 60 per cent. of the casualties amongst the Government troops were in the ranks of the expedition, though it only supplied 30 per cent. of the fighting men. Nor was the actual loss at the hands of the enemy the only way in which the expedition suffered, for many of the officers and men had been seriously affected in health from climatic causes and the hardships of the campaign; our trade goods and stores had much decreased, and our transport, left to native supervision, had dwindled considerably during the rainy season, while the surviving animals were in very poor condition.

The Protectorate informed me that they could not make good our losses, and found that they could not spare the full escort of troops

which we required to continue our work, but seventy-five Sudanese, some cattle, and some trade goods were handed over to us.

When everything had been done, our position, as compared with its former one at Ngare Nyuki, showed what the expedition had suffered in saving Uganda. Our strength was reduced 33 per cent. in Europeans, 60 per cent. in escort, 43 per cent. in transport, and 15 per cent. in Swahilis, while our remaining trade goods would only suffice for four or

A STATION ON THE UGANDA RAILWAY.

five months, and the fresh supply ordered from the coast nine months before was blocked on the road by the reinforcements for Uganda.

On the other hand, I was fortunate in having as fine a staff of European officers as any commander could wish for, and a body of Swahilis who had learned in the best of schools—that of active service—to trust and depend on their officers and themselves.

During the fighting in Uganda geographical work had not been altogether neglected. In Buddu and Ankole the late Captain Kirkpatrick had added to our knowledge and discovered a small lake. In Bulamwezi Lieut. Bright had filled in a blank between the Maanja and Lugogo

rivers; while in the north of Chagwe and Namionjwa I had been able to rectify the existing maps. Lake Ibrahim was found to be non-existent in the form shown. During a reconnaissance in canoes on Lake Choga, I was struck by the fact that it had no land horizon on the east, and learned from the natives that it extended some 50 miles in that direction. It was not till some months later that this could be verified by a flying column under the late Captain Kirkpatrick and Captain M'Loughlin, which mapped out the configuration of the lake. This work, which has already appeared in the *Journal* of the Society, shows that Lake Choga is worthy to have a place amongst the minor reservoirs of the Nile. They also heard of a large lake north of Choga, with which it is said to be connected by marshes; this, however, they were unable to visit, as it was situated in then hostile territory, so a chance is left for some enterprising Uganda officer. Another large lake, Mpologoma, was also heard of which is situated between Usoga and Mount Elgon, and, indeed, indications of this lake were afterwards seen from the western spurs of the mountain. The interior of Usoga is not unknown to individual officers, but unfortunately it has never been mapped, so the Mpologoma region affords another field for local geographical enterprise.

In addition to this work in Uganda, I must not omit to mention what Major Austin had already completed during his journey from Ngare Nyuki to Save and thence to Mumia's, a journey during which he had not only secured new information, but had been able to correct mistakes in the work of others who had previously sketched in the country under less favourable conditions. During the first part of the journey northward from Baringo he travelled through the country of the Suk, a tribe who mostly inhabit mountainous country and dwell in little scattered hamlets of a few huts instead of in villages. They are not wholly pastoral, but their cultivation is in small patches which produce little more than is necessary for their own consumption. These patches of cultivation are often irrigated with a certain amount of skill. The Suk have always been known as good fighters who have held their own against the Masai, and, indeed, in September the expedition met a war-party of Masai who were returning after an unsuccessful raid into Suk country, where they had been very roughly handled by these hardy mountaineers.

The Suk elders candidly informed Major Austin that at first they had contemplated attacking his caravan, but that, after consideration, they thought he was too strong, and so preferred peace. The expedition evidently improved on acquaintance, as ultimately we became great friends, and the natives looked after the steel boat and its stores for some months without stealing a single bolt; and still later, when Lieut. Bright revisited Marich, the population gave him an enthusiastic reception, and got gloriously intoxicated in his honour.

Major Austin left the Suk country at Marich, and marched west

to Mount Elgon, the route at first leading along the Moroni river through a very mountainous and wooded defile, where the caravan only made good 10 miles in three long days. Once into the open grass country of the Guash Ngishu plateau, his column made better progress to Save, on the northern slopes of Mount Elgon, whence he marched to join the fighting force at Lubwa's in Usoga.

Leaving Mumia's in the end of June, 1898, we marched to Save by a route to the west of Mount Elgon, as the districts on that side were reported to be very rich in food. The southern and eastern base of this grand mountain mass, to march round which is nearly a month's journey, had already been visited by the late Joseph Thomson, Messrs. Jackson and Gedge, as well as by Mr. Hobley and officers of my expedition. The summit had been reached in 1890 by Jackson and Gedge, who found it contained a great crater-like depression some 8 miles in diameter. But the only previous traveller who had visited the western slopes was Mr. Hobley, who had in 1896 made a very plucky trip right round Elgon. He had kept at a comparatively high altitude, and found the route very difficult owing to the heavy ascents and descents over the numerous spurs. Our route was still more to the westward, with a view to avoiding so much mountain work, but even so we had to do a good deal of climbing.

One striking feature of Mount Elgon is that, while on the east it slopes down to the plain comparatively gradually, on the south, west, and north the gentler upper slopes end abruptly in a great line of precipitous cliffs, in which are situated the famous caves. On the west there is a great mass of broken and rugged ground below the cliff wall, and on the north there is a series of fertile terraces, but still the general features are as stated. The western slopes are densely inhabited by numerous small tribes of Bantu origin, who style their country Masawa. The cultivation is the most luxuriant I have seen anywhere in Africa; the hillsides are one mass of banana plantations, while in the well-watered valleys are extensive fields of grain, sweet potatoes, and beans.

Mr. Hobley found on the south that there was reported to be a tribe who lived on the upper slopes, called the Elgonyi, from whom the hill was supposed to get its name. We not only heard of the Elgonyi on the south, but also on the west and north, so I am inclined to think that the old name Elgon is more appropriate than Masawa, which is really the district lying on its western slopes.

The work of our expedition has enabled a fairly accurate map of the lower slopes of Mount Elgon to be prepared, but the more elevated parts will well repay further work both for the zoologist, entomologist, and botanist, as this mountain region appears to possess varieties and species of its own.

We had already established the most friendly relations with the tribes on the northern terraces of Mount Elgon, who are an interesting

people allied by blood with the Wanandi and Wakamasia. Indeed, I hope to show that these, with the Walako, south of the mountain, the Wakamasia, Waelgeyo, Wasuk, and Wanderobo are all fragments of a great and widespreading tribe which held the surrounding country before the advent of Masai and Bantu conquerors.

These Wasave are a well-proportioned but small race of mountaineers, not addicted to much in the way of clothing, but who make very handsome girdles and head-dresses by an embroidery of cowrie shells sewn on leather. They carry spears and large shields, and use poisoned arrows; the poison appears to be of the same vegetable type as that in use farther south, and is very fatal when fresh, and comparatively harmless when old and dry. The Wasave told us that originally their extensive cultivation extended on to the plains around Elgon, but that under pressure of more powerful tribes they had gradually been compelled to restrict themselves to the lower slopes of the mountain.

At Save, in the end of July, the expedition was organized into three columns. One of these under Major Austin carried out that portion of our work which was contemplated in the neighbourhood of Lake Rudolf. I need not say much about this part of the work, as Major Austin is himself to tell us to-night something of his experiences, but I may say that he successfully carried out the task I set him, in the face of great difficulties, and, though under most anxious conditions, has done a great deal of very valuable geographical work.

Another column was entrusted to Lieut. the Hon. Hanbury Tracy, who had to maintain our posts at Save, keep open mail communications, and organize a fresh transport corps by purchasing and equipping donkeys. This he had to do single-handed, and he did it with a success and punctuality which reflect on him the greatest credit.

The third column, under my personal command, advanced northward into Karamojo and the unknown regions beyond, which were a blank on the existing maps. Previous knowledge of these regions was practically *nil*. Mr. Donaldson Smith had seen, when north of Lake Rudolf, great grass plains stretching towards the Nile. Mr. Cavendish, from the summit of Mount Lubur, beheld range after range of forest-clad hills. Jackson, Gedge, and Hobley, from the northern slopes of Mount Elgon, had described a great swampy plain stretching to the Nile. These descriptions were somewhat conflicting. Each was undoubtedly right from their point of view, but these points were widely separated.

So much for what had been seen. What had been learned from natives was even more vague. Emin had heard of Karamojo as scarce in water and rich in camels; Martin and others that there was no cultivation in Karamojo, which was inhabited by scattered hunters; while we had information of a rich country like Kavirondo, though no two people agreed as to how to get there.

When we first left Mount Elgon, we were inclined to think that

Jackson and Hobley were not far out, for our first four marches, as we shaped our course for the eastern base of Mount Debasian, led through difficult swamps, which drained into Lake Salisbury. We afterwards discovered that by keeping still more to the east most of the swamps could have been avoided, but knowledge of this kind is often the result of experience.

Debasien is a magnificent rocky mountain, rising to several well-marked peaks, the highest of which reaches an altitude of 9700 feet

VIEW IN NANDI.

above the sea. On its upper slopes much vegetation was seen, and it is inhabited by a weak and poor tribe who are allied to the Suk, the former owners of the country. Debasien was formerly wrongly named after the district Likakisira, which lies at the foot of the mountain.

Once we passed Debasien we found the country became much drier. It was at this season fairly well watered by numerous small streams flowing to the Turkwel, and for the most part consisted of grass land, with a good deal of mimosa bush and a fringe of forest along the more important streams.

We had now a good view of another mountain, Moroto, which had an altitude of 10,000 feet, and formed an even more imposing mass than Debasien. From this mountain a range of peaks extended to the Turkwel, and we learned that this range was inhabited by the Wasuk. These peaks were very useful, as they were common to the surveys of Major Austin and myself, and thus enabled us to connect up our work and secure a cross-check.

So far we had seen nothing of any inhabitants, except a small settlement of Karamojo hunters; but on the eleventh day from Save we arrived in the highly cultivated and thickly peopled district of Manimani, which lies south-west of Mount Moroto. Lieut. Hanbury Tracy had already pushed a reconnaissance to this point, and established friendly relations with the people. And we found they were soon on the best of terms with us, more especially as we had the good fortune to bag an elephant, the meat of which made many of them happy.

At Manimani we met a Swahili trading caravan which had just returned from the north. They reported a force of three hundred Sudanese ten days distant on our proposed line of advance, and handed us a letter they had intercepted, which showed that the people were in communication with our old enemies the Uganda mutineers. This was serious intelligence, as my escort was only fifty men, and, all told, we could barely put in the field two hundred and fifty rifles. I accordingly determined to leave all our heavy baggage and transport at Manimani under a small escort, and push on with a light fighting column of two hundred rifles, to ascertain the attitude of the Sudanese before committing my heavily laden caravan to a possibly powerful hostile combination.

From Manimani our route lay west-north-west to the Karamojo district of Bukora, which was of even greater extent and more highly cultivated than Manimani. Indeed, the amount of cultivation in this part of Karamojo was very striking, consisting as it did almost entirely of millet. The river Akinyo, which rises in Mount Moroto, and flows through the districts of Manimani and Bukora, has a sandy bed 40 to 60 yards in width, and with well-defined clay banks. Water flows during the rains, and can always be found a few feet below the surface in the driest of seasons.

The Karamojo people are a magnificently developed people of great stature; indeed, they appeared to us as almost gigantic after our stay amongst the Wasave. To give some idea of this, I may mention that our Sikh escort, picked men from two of the finest Sikh regiments in India, did not look big men amongst a crowd of the Wakaramojo. The Wakaramojo have a very warlike reputation, and it was not hard to believe this well founded, since, living as they do in an open grass country in flimsy villages, and possessing immense herds of cattle, donkeys, sheep, and goats, they must be stout fighters to protect their

property. I rather fancy they are also excellent raiders, as there was a suspicious dearth of live stock amongst the weaker tribes on the borders of their country. We found them, however, most friendly to Europeans, frank and outspoken, and without exception the most honest race of savages I have ever dealt with in Africa. The people live in small scattered kraals, each of which is surrounded by a light stockade of branches. The huts are small, and are thatched in successive layers, which give them an unusual appearance. Their live stock is driven into the kraals at night, and the extremely small entrance closed with a thorn bush.

Each village or little group of villages has its own chief, but important matters are settled by a council of all the chiefs, and as there are very strict and recognized rules regarding the settlement of serious disputes, there is no fighting between these numerous settlements. In case of war against surrounding tribes, the council of chiefs elect two fighting leaders; in this respect, as indeed in many of their customs, they resemble the Masai.

The women have perhaps more latitude allowed them in Karamojo than in most African tribes, as marriage is not merely a matter of barter. If the girl objects to marry her suitor, her refusal is absolute and settles the matter. This fact naturally makes the relations of the sexes more in keeping with civilized ideas. The women are decently clothed in skins, but the men wear no clothing, unless the extraordinary felted head-dress, which hangs low over their shoulders, is classed as clothing. This head-dress has already been described by other travellers, as it is also worn by the Turkana and Suk.

A Karamojo warrior, with his felted hair-bag decked with ostrich feather, his iron collar and ivory bangles, is a very striking sight. He carries two spears, which can be used either for throwing or stabbing, a knobkerry, and a very small light shield made of hide. Many also wear a small circular wrist-knife, with which terrible wounds can be inflicted in a rough and tumble. The cutting edges of the knife and of the spear-heads are carefully protected by ingenious sheaths made of leather. Many of the customs of the Wakaramojo, like their language, are closely related to those of the Masai, and they have the same belief in one Supreme Being and in various omens, but into these there is hardly time to go at present.

From Bukora our route lay north, along the arc of a circle to Dodosi, another large Karamojo district of great fertility, and six days distant. The road lay for the most part over fine open grass plains, which swarmed with game, but in places where we threaded our way amidst small rocky hills we encountered a good deal of bush. The river-courses were mostly dry, but water could be obtained by digging or from rock pools, the position of which was known to our native guides. At Dodosi we learned that Karamojo extended northward for nearly

a degree, but that the plateau became more arid and uninhabited the farther north we got, and could only be traversed for a few months in the year.

From Dodosi, where the people were as friendly as in the south, we turned almost due west in search of food; for, though there was abundant cultivation in Manimani, Bukora, and Dodosi, the crops were not yet ripe, and grain could not be purchased.

On this western march to Gule we entered a new style of country as we neared the edge of the Karamojo plateau, which was broken by ranges of bold mountains rising from 7000 to 9000 feet above the sea. The rivers were now actual flowing streams instead of dry beds, and ran, to a great extent, through well-wooded country.

On August 21 we reached Gule, a fertile valley amidst the rocky hills of Rom, and at once sent out to invite the Sudanese to visit us. This they did on the 23rd. They halted their main body some distance from our camp, while their advanced guard with a flag and trumpeter approached us. On finding we were friendly, a call was blown on the trumpet, which was a mysterious machine made of gourds and leather, and the main body marched up in good order. There were, however, only two old Egyptian soldiers amongst them, and the remainder were trained Shulis armed with muzzle-loaders.

From these men we learned that the Uganda mutineers were beating up recruits amongst the old Sudanese who were still scattered about in this part of the world, and were located in somewhat unpleasant proximity to our further line of advance. One old ruffian calmly admitted he was an emissary of the mutineers, and had left their camp in July. Still, we had learned that these Sudanese were not formidable in themselves, and were grateful to them for bringing us a quantity of food for sale, as the local supply at Gule was insufficient for our wants. It was, however, apparent that additional supplies could be obtained from the neighbourhood, so on August 30 Lieut. Pereira and I, with most of the unarmed men and a small escort, returned to Manimani to bring up the remainder of the column and baggage, leaving Captains McLoughlin and Kirkpatrick with the bulk of our fighting men at Gule, to lay in a supply of food.

I need not trouble you with our return journey. Suffice it to say that, as we had only five days' rations with which to cover thirteen marches, we travelled fast. On September 11 we began our return march to Gule, but when we were about halfway most disquieting news came from that part. It appeared that the Uganda mutineers, reinforced by scoundrels of all sorts, were nearer to Gule than had been expected, and that hardly a day passed without their spies visiting our camp or its neighbourhood. Moreover, the local natives said they were afraid to bring us food, for fear of incurring the displeasure of the mutineers. It transpired that this was due to Jardin Effendi and seventy men

having reached a point only 20 miles from Gule, but when this warrior heard that we were the same people he had fought against in Usoga and in consequence left very hurriedly, the situation improved, and food began to come in plentifully.

However, the news led me to withdraw my advanced post to Titi, which was in the Karamojo country, where the Shuli sympathizers of the mutineers were afraid to penetrate. Titi had, moreover, the advantage that it was open and healthy, and in every way was better fitted for a lengthened stay, especially as the crops were now nearly ripe, and in a fortnight there would be an abundant supply of food.

A KAVIRONDO CHIEF.

By the beginning of October the force was reassembled at Titi, and on the 4th of that month we commenced our advance to Latuka. Captain Kirkpatrick with seventy rifles remained in charge of Titi, while McLoughlin and Pereira accompanied my column, which mustered nearly two hundred rifles. We had not only the anxiety of having the Uganda mutineers on our flank, but had also learned that there was an

independent force of Sudanese in Latuka, who were thought by some to be allied to the Dervishes, and who might also be in communication with the mutineers, as we knew the latter had tried to win them over. To conceal our movements as long as possible, we chose a new route, which kept us under cover of the Nangiya mountains. At first we kept along the north-east side of these mountains, whose culminating peak is nearly 8000 feet high; but, finding that part was so overgrown with long grass as to make progress very slow, we decided to cross the range to Solian, where we were informed there was a denser population, and presumably better roads. It took us two days to cross the range, the passes reaching altitudes of 5300 and 5100 feet. We found the mountains inhabited, and that there was a great deal of cultivation by the banks of the numerous mountain-streams. The scenery was very beautiful, and from a small plateau above Solian we got a magnificent view right to the mountains of Agoro and Logire, which are the portals of Latuka.

All these peoples who inhabit Rom and the Nangiya-Solian range are Langu, but not pure Karamojo. Neither in physique nor in fighting-power do they equal this tribe, but they are friendly people, with a good idea of working in iron and of agriculture, and make use of irrigation to a considerable extent.

From Solian we pushed westwards to the isolated hills of Kiteng, where there was formerly an Egyptian post. The natives here were Shuli, but were very well disposed and anxious for us to make a stay with them. This could not be done, as it was necessary to push on. The chief of Kiteng, who had previously visited Latuka, volunteered to be our guide. Under his guidance we still kept west to Akol, another cultivated region round a small group of hills. Again we had an enthusiastic reception from the natives, who were most anxious that trade should once more visit their country.

It was a source of great surprise to these natives that I was able, from one of Smith's old maps, to now recognize some of the dominant points in the hills to the westward. Ultimately I think they concluded I must be a son of that distinguished traveller who had acquired by heredity some mysterious instinct for locality.

From Akol the route lay nearly due north to Tertenia, another great mountain nearly 8000 feet above the sea, and whose slopes were densely peopled by a very friendly and prosperous tribe. The villages were for the most part perched amidst the rocks and cliffs, and evidently the sites were selected for defensive considerations. But the amount of cultivation all along the base of the mountain was surprising, a grain called mwele having, however, taken the place of millet. The natives brought us presents of beautiful honey, goats, and fowls, and here we added to our train, as nearly a dozen men decided to accompany us to Latuka.

The country between Solian and Tertenia had been more covered with long grass and bush, and was far more trying to march through; but, on the other hand, the road was good, as there seems to be a good deal of inter-communication between the various settlements.

One march from Tertenia and we encamped in Latuka, under the shadow of Logire, a fine mountain whose summit is 8700 feet above the sea. Here we were surprised, I may say unpleasantly surprised, to see several men approaching us in the familiar Dervish jibbas. They were,

VIEW IN USOGA.

however, very cordial, and explained that, though Latuka had joined the Dervishes to save the country from devastation, and had in consequence been presented with a complete outfit of jibbas, the sultan and people would be most happy to see us, as there were no Dervishes at present in Latuka. We were also told that, owing to locusts, there was no food to be had in that country except ground-nuts.

However, there was food in Logire, so we halted a day and laid in a supply. Then we moved down the magnificent valley between the mountains of Logire and the still higher Agoro range, and that night

camped near a typical Latuka village with its high conical huts. We were at once visited by some of the village dignitaries, who wore the extraordinary Latuka head-dress, which resembles a brass helmet. These people did not wear jibbas, but when they saw our Sikhs they were much alarmed, thinking they were Dervishes, and were in two minds as to whether they ought not to go home and get into Dervish kit at once. However, they recognized that the presence of Europeans rather discounted the Dervish theory, and we were soon great friends. Next day we got amongst numerous villages, all built in strong positions, and for the most part stockaded or shut in by bamboo fences. The high-pitched conical roofs were very striking after the usual type of hut to which we had been accustomed. The Latuka warriors were also very picturesque, but we did not see much of the handsome bead head-dress which Baker describes. I suppose the fashion must have changed, as the brass-helmet arrangement was now in vogue. The arms carried are two long throwing-spears and three small assegais, the latter being very neatly worked. The shield is large and finished above with two semicircles, while the square lower end is ornamented with a tuft of ostrich plumes. A great many of the men also carried muskets, and not a few Remington rifles were to be met with, but the supply of ammunition was small.

At first the people were not inclined to let us pass, until the sultan, who has a very real power, had signified his pleasure regarding us. But their suspicions were allayed when I sent on an Arabic letter to the sultan. It afterwards transpired there was no one in Latuka who could read an Arabic letter; but that apparently did not matter, as they recognized the familiar characters, and decided we could be no others than friends.

The letter having been sent off, we proceeded on our way, and camped about 4½ miles from Logguren, the residence of the sultan's mother. That evening we heard a great drumming and shouting near Leggomen, and about 11.30 p.m. the camp was visited by five Sudanese, who were delighted to recognize old friends amongst my Sudanese escort. From them we learned that the sultan was highly gratified by our arrival, and would himself visit us next morning.

On October 21, the sultan, with an immense following, visited our camp, and we were soon on the most cordial terms. We found a few of the principal men clothed in a coarse cotton, but the large majority were naked. Every sort of trade goods was in great demand, but, as we had been warned, food was very scarce.

From the sultan we learned that the Dervishes had raided into Berri, 35 miles north, and were established at Bor, from which they have since moved in consequence of the Congolese advance. We also learned that communication on the Nile had been interrupted, and no gunboats were at Lado or even heard of. We had still in hand ten days' rations, or sufficient to get to Lado, but had not sufficient food or trade goods

to get back, even if food could be purchased there. Berri was said to be devastated, and the country east of Berri uninhabited. In the circumstances there was nothing for it but to turn back, but first we all visited Tarangole, which we found to be a considerable town about a mile long, and densely packed with huts.

The sultan showed us over one of his large huts. It had the usual high-pitched roof, and appeared to consist of a circular mud wall and a circular verandah. We found, however, that the roof was carried on the verandah posts, and that 2 feet of air-space existed between the top of the mud wall and the roof. The wall was nicely plastered, and

EMBARKATION AT LUBWA'S.

on the inside were some rude pictures done in coloured clays. One of these was a historical picture, representing the sultan riding on his state donkey.

It was interesting to compare our impressions with those of Baker. The first thing that struck us was the great dearth of cattle, and the sultan told us there were but few left in his country, though they still had large herds of goats.

Baker had noted that the Latuka people were quite different from the Nilotic tribes, and he was inclined to class them as Gallas. I noticed that most of the few words of Latuka which he gave were identical with Masai, and on making out a more extensive comparative vocabulary, I found the connection between the two languages was

well-marked. Indeed, the Latuka language showed an even closer connection with Masai than with the nearer and intervening language of Karamojo.

Our return journey need not be gone into in any length. During a portion of the way we made a *détour* by Kuron, and found a pleasant mountain country with fertile valleys, many of them well irrigated and inhabited by a friendly and prosperous population. One march was notable, as it lay through an extensive jungle of bamboo, at the low altitude of 4000 feet.

We reached Titi on November 6, to find that our post there was flourishing, that the natives were more friendly than ever, and Captain Kirkpatrick had carried out some useful exploration to the north. At this place we learned, for the first time, of the dispatch of a powerful expedition from Uganda in July, under Lieut.-Colonel Martyr, with orders to proceed down the Nile. You all know that this expedition was unfortunately stopped by the sudd.

On November 15 we began our return march to Save, but were delayed at Bukora owing to the treacherous murder of our comrade, Captain Kirkpatrick, D.S.O., and some of his men by the natives of Nakwai. His murder was promptly avenged by a punitive expedition, which taught this treacherous tribe a bitter lesson; but nothing could make up for the loss of a brave comrade who had shared in our fighting and our successes, and had repeatedly been noticed for his gallant conduct. His death could not fail to cast a gloom over our return, as he had deservedly won the respect and esteem of both officers and men.

On December 12 we reached Save, and from there commenced our return march to the coast, which was reached on March 5.

The geographical results of the expedition have been instrumental in filling in a blank on the maps between Lake Rudolf and the Nile, and in greatly adding to our knowledge of the drainage system of these regions. The most marked result was the discovery that the high and healthy plateau, known further south under the names of Mau, Nandi, and the Guash Ngishu, runs far to the northward, though at a reduced altitude. Immediately north of Elgon, this plateau is much narrowed by the extension eastward from the Nile of a great swampy depression, in which are situated numerous lakes, such as Choga, Salisbury, and Mpologoma. Northward of this, again, the plateau throws out numerous mountain ranges with a general north-westerly direction; the most marked are the Nakwai, Lobor-Agoro hills, the Nangiya-Kuron-Logire-Latuka range, and the Morongole-Harogo range. From views of still more distant mountains, whose exact position could not be determined, the same structure would appear to characterize the country still further to the north.

The western edge of the Karamojo plateau, as well as its offshoots,

the ranges named, is well watered, but the plateau itself is far drier, and it is doubtless to this fact that, in spite of its lower altitude—4000 to 5000 feet above the sea—it is so healthy. Mount Elgon and the western edge of the Karamojo plateau would appear to mark the eastern limit of the double rains, while on the Karamojo plateau itself there is only one rainy season—May, June, July.

The same conditions appear to prevail further north, where the plateau cannot be crossed except in the rainy season. This, indeed, prevented our reaching the reported gold-producing oasis of Lali,

KARAMOJO HEAD DRESS.

where our Swahilis would have us believe a certain amount of English is spoken.

Another feature of this newly explored country is the great altitudes attained by its numerous mountains, varying as they do from 6000 to over 10,000 feet, and that several of the highest are as far north as the 4th degree, namely, Agoro, Logire, and Harogo.

Geologically, we cannot say much about the country, but shortly after passing Elgon we got amongst granites and schists, and in the more northern parts explored found thin beds of sandstone and extensive deposits of Kankar lime. Iron ore exists in considerable quantities, and gold is reported, though none was actually seen.

Elephants and game are very abundant. One interesting point I may mention was that the common gazelle appeared to be the Petersi, which has by some been considered a cross between the Grantii and Thomsonii. As, however, neither of these latter are found, this hypothesis would appear untenable.

One of the most interesting points was the investigation into the affinities and origin of the many different tribes encountered. The country in which our labours lay appeared to be the meeting-ground of the Bantu, Negro, and Hamitic races, and scattered amongst them were many whose classification had always been rather a puzzle. The elucidation of the grouping of these tribes is a very fascinating study, and it is to be hoped that the results we have secured, imperfect as they are, will encourage others who follow us to devote more attention to this subject.

It is not impossible, even, that the dates of some of the great migrations may be approximately fixed from a study of the different names employed for trade goods, which could have only reached them from outside sources, and whose local name would be likely to be borrowed from those sources. It is impossible, in such a paper as this, to go fully into this question, especially as we have not yet been able to completely compile our results in proper form for investigation. But roughly we may say that the tribes encountered would appear to group themselves into four main families :—

The Negro type, which has previously been investigated by others on the Nile, and which includes the Shuli, and the totally isolated offset, the Wanyipa, in South Kavirondo.

The Bantu group includes Uganda, Unyoro, and Usoga, Ketosh Mamwa, and South Kavirondo. Then comes a great group of tribes which are of the same original stock as the Masai, whose origin has long been a matter of dispute. Dr. Cust places the Masai in the Nuba-Fulla group, while the Karamojo or Lango are placed amongst the Hamitic. I am not expert enough to say to which group they belong, but I can say that Latuka, Karamojo, Donyiro, Turkana, and Elgumi show so close a resemblance in customs and language with the Masai as to be undoubtedly of a common origin, and, moreover, show some connection with Galla and Somali. Strange to say, the Latuka and Masai * are more closely connected with each other than with the Karamojo subgroup, while the Karamojo, Donjiro, and Turkana have an identical language, and are amongst themselves admitted to be of the same blood.

The Masai, as far as I could gather, or to be strictly correct the Loegop, once extended from Samburu, east of Lake Rudolf, through the present Suk country to the south of Kilimanjaro. They were divided into three main divisions—Samburu, Guash Ngishu, and Masai. The Samburu are now represented by the Kore amongst the Rendile, and by

* Dr. Ravenstein pointed this out in 1884.

the people of Njemps, though they at one time occupied Lykipia; the Suk, pressed forward by the Karamojo, were driven into the mountainous country between Rudolf and Baringo, and the Samburu were thus separated and weakened. The Guash Ngishu inhabited the plateau of that name, and are reputed to have exterminated the former inhabitants, called Senguer. The Guash Ngishu, known to Swahilis as Wakwafi, and their kindred the Masai had a great war, in which the former were so weakened as to be unable to hold their own against surrounding tribes, and are now scattered dwellers in Nandi, Kavirondo, and Ketosh.

The Masai proper are the more southern of the three divisions of

CAMP AT SOLIAN.

the Loegop, and the only one which at present has any strength, though even in this case the process of disintegration appears to have set in.

There still remain various tribes which were formerly considered to be practically distinct, but these would appear, as the result of our investigations, to be broken fragments of a great aboriginal tribe which occupied the surrounding country before they were dispossessed by the inroads of the Loegop, Karamojo, and Bantu peoples. Of these the Nandi, Sotik, and Lumbwa people have previously been considered of the same stock, and to these have more recently been added the Kamasia. Similarly, Mr. Hobley established that the Wazako south of Mount Elgon are allied to the Wasave, north of that mountain, and

showed affinities with the Nandi, who again were considered to be related to the Masai. The Suk have, however, previously been supposed to be distinct, and I am not aware that any connection between these tribes and the Wanderobo, admittedly a broken people, has ever been suggested.

We find, however, when comparing the languages of the Nandi, Save, Suk, and Wanderobo, which show little connection with other recognized groups, that 33 per cent. of their words are alike through all four tribes, while 66 per cent. are common to three out of the four. This would, I think, bear out my contention that they are all branches of one aboriginal tribe, which has been broken and driven to the hills and mountains by the incursion of stronger races. And a singular confirmation of this theory is, that the dwellers on the isolated mountains in South Karamojo talk, not Karamojo, but Suk.

While thus giving a short outline of some of our work, I must not close my paper without acknowledging how much I am indebted to the officers and men I had the honour to command, who, tried and worn as they were by the hardships of the campaign in which my expedition saved Uganda, yet followed me with the same unflinching loyalty and zeal into the unknown difficulties which the legitimate work of the expedition might entail. No one could have wished for a better staff, and that the expedition was able to do so much as it did was in a large measure due to their unfailing support.

Our Sikhs have fully sustained the high reputation of their regiments. And the conduct of our Sudanese afforded one more instance of their admirable military instincts, and of the devotion to their officers, which is inspired by justice tempered with firmness.

Our Swahilis have, I am proud to think, in our hands, enhanced their reputation for pluck and endurance, and created for their race a new and striking record for soldierly qualities when led by officers they know and trust.

To the cordial co-operation of Europeans, Sikhs, Sudanese, and Swahilis, are due the results secured by the Juba expedition.

II. LAKE RUDOLF.

By Major H. H. AUSTIN, R.E.

On the reconcentration of Colonel Macdonald's expedition at Save in July, 1898, I was entrusted with the command of a column to proceed to the north of Lake Rudolf, and I propose very briefly to try and give you some idea of this portion of the exploration carried out by the expedition. An advanced food depôt had been previously established by Lieuts. the Hon. Hanbury Tracy and Bright at Ngaboto in July, and Captain Ferguson and I left Save on August 1 to join those two

officers there. The column consisted of some 160 men, which was further increased to 180 on arrival at Ngaboto. For transport purposes, in addition to our Swahili porters, we had some 90 donkeys and 14 camels. We reached Ngaboto on August 11, following generally the river Turkwell, which we struck by a cross-country route on August 6. Just before the river enters the plains to the east of the Chemorongi range of mountains, it passes through a deep gorge, and here we had to leave the river and cross the range by an exceedingly difficult mountain pass. Although this march was one of only some 10 miles, it took fifteen hours to accomplish, as it had been found necessary to unload all our animals in order to get them over the mountains. The following day the post formed at Ngaboto on the bank of the river Weiwei was reached, and here final arrangements were made for the start to Lake Rudolf. Lieut. the Hon. Hanbury Tracy was deputed to take command of the base at Save, and to organize transport to bring on food to meet me on my return journey from the north of Rudolf, and with this end in view he started for Save on August 14. Captain Ferguson and Lieut. Bright were to accompany me to Rudolf. The previous year, when at Marich, I had obtained the services of a very capable Suk guide, Nyanga by name, who had remained at our base in Save throughout the mutiny operations, and who was now to conduct us northward.

On August 15 we commenced our journey from Ngaboto, and followed the river Turkwell in a northerly direction for the first ten marches. The river Weiwei joined the Turkwell some 7 or 8 miles from our post at Ngaboto, and thence on it remains a splendid stream for several days, the bed being often 500 or 600 yards wide, but it then gradually diminishes in size before reaching the point where it makes a big sweep east at Kagwalas. The country traversed during these days was at that time an uninhabited wilderness—the soil very stony and arid, and covered with much bush and thorn. The vegetation along the river-bank itself is very dense, and elephants abound in these splendid forest retreats. To the east of the river several isolated ranges of low hills are passed, whilst to the west the Chemorongi range separates the high Karamojo plateau from the low-lying valley of the Turkwell. Many dry, sandy river-beds were crossed along the east bank of the river, but it would appear that only during periods of exceptional rain are they converted into running rivers. As we approached the big bend of the river, and entered the Ngamatak district, we once again met Turkana in large numbers. These possessed droves of magnificent camels, herds of cattle and donkeys, and numerous flocks of goats and sheep. They are essentially a pastoral people, and make little attempt to cultivate the extremely arid and sandy soil, which is incapable of producing any crops, except in a few small patches of alluvial soil in the river-bed. From Kagwalas we had two routes open

to us: (1) either to continue along the river Turkwell in an easterly direction to Lake Rudolf, and then proceed north along the lake-shore; or (2) to take a north-north-east course across a sandy desert, and strike the lake-shore higher up. As time was of utmost importance to us, we decided to adopt the desert route, and after six days of considerable hardship and sufferings, owing to the extreme scarcity of water, and grazing for the transport animals, we reached the shore of Lake Rudolf at 3° 52′ 30″ N. During this desert march we crossed several large river-beds, all of which unfortunately were quite dry, and water was only obtained by digging deep into their sandy beds. As we approached the lake the country traversed changed from undulating, open sandy plains to low hilly ground, much broken and intersected by numerous small nullahs apparently running in all directions. We were now amongst the low coast-hills bordering the western shores of the lake, and on August 31 we got our first view of this grand expanse of water across a small plain 4 or 5 miles in width, which extends from the low hills we had penetrated to the water's edge.

We camped that day for the first time on the lake-shore, at the head of a small lagoon separated from the open water by a low sand-bar, thrown up by the action of the waves. The existence of numerous similar lagoons is one of the most distinctive features of the western shores of Lake Rudolf. These lagoons are much frequented by various species of water-birds, such as whistling teal, Egyptian geese, pelicans, flamingoes, spoonbills, whimbrel, ibis, herons, egrets, and cormorants, which provided a most welcome change of diet from over-driven goat. During our journey north along the lake-shore, and later, on our return to the mouth of the Turkwell, we noticed many evidences of a westward encroachment of the lake, such as palm trees surrounded by water and partially submerged. Indeed, at one point we observed a regular line of trees, extending for a distance of between 2 and 3 miles out into the lake. We found the water far from pleasant to the taste, as it was impregnated with sodium, and in consequence scarcely appeased one's thirst. The heat was very great, as we were now only some 1250 feet above the sea, and I think Rudolf is the only part of Africa where we found the nights at all resemble the Indian hot-weather night, with which many of you are doubtless familiar. The waters of the lake, however, abound with fish, mostly of the cat-fish tribe, which provided the sportsmen amongst our porters with many a good supper; whilst crocodiles were also seen in large numbers, in addition to a few hippopotami.

The Turkana living along the lake-shore were extremely suspicious of the advent of the white men, and gave us a wide berth until our return, as they drove away their flocks into the hills bordering the lake on our approach, and only returned after we had passed their deserted kraals. These latter were of a most primitive type, merely consisting of wind-shelters of a few thorn branches for the natives,

whilst in the centre of a thorn fence the goats, sheep, and other animals were pounded for the night. We passed under Mount Lubur on September 6. Mr. Cavendish has already described it to you as an extinct volcano, with a splendid rocky escarpment below its summit. Two days later we crossed the Turkana border, and reached the district of Marle. Here we found the natives most friendly, and in the small settlements of Komogul and Lumian they had cultivated plots of alluvial soil near the water's edge, which subsequently proved the salvation of the column. Rounding the northern limit of Lake Rudolf, we camped near the mouth of the river Omo on September 12, and were all very thankful once more to get fresh water. This splendid stream is, in my opinion, the only perennial feeder of Lake Rudolf, as I have good reason to think the waters of the two large rivers—the Kerio and the Turkwell—seldom, if ever, reach the lake. The Omo is a magnificent stream from 100 to 150 yards in width, and, judging by the large volume of water flowing between its banks, I have little hesitation in saying it must rise in the highlands of Abyssinia, though I believe this fact has been disputed. It appears very deep, and I should imagine would be navigable for some considerable distance north. We made three marches up the Omo, hoping to obtain fresh supplies of food at Marle, a reported land of Goshen, as we were now almost at the end of our resources. On arrival there, however, we found the people starving and suffering from small-pox, as they had lately been raided and their country devastated. We were unable to obtain a particle of food, and were compelled to beat a hasty retreat to Lumian, where, by dint of bartering, we were at length able to purchase some seventy bags of grain wherewith to face the return journey of thirty days to Ngaboto, where I hoped to meet Lieut. Hanbury Tracy about October 22 with fresh supplies for our relief.

We left Lumian on September 24, and retraced our footsteps along the lake-shore to the point where we had first struck it. As the men were much worn by the short rations to which I had for long been compelled to restrict them, it was decided not to attempt the desert route again, so we continued south along the lake to the mouth of the Turkwell, which we reached on October 6. Our camp was only some 5 miles from the lake here, and the bed of the river at least 1000 yards wide. We halted there one day, and Lieut. Bright followed down the river-bed, which gradually diminished in size, and after a short time became lost on a sandy stretch of desert about half a mile from the edge of the lake. It appears unlikely, therefore, that, in spite of the large volume of water found in the river in the upper reaches during rainy weather, it ever reaches the lake at all. Four marches in a westerly direction along the river-bed, in which we had to dig for water, brought us to our former camp, where we had left the Turkwell to strike across the desert. We knew we were now only ten days from Ngaboto, and that place was

safely reached accordingly on October 22; but not without fighting, as for a week we were subjected to an exceedingly annoying guerilla warfare by the Turkana, bands of whom followed the line of march and made frequent attacks on the column. We were now out of food, and the enthusiasm was very great in consequence when we met Lieut. Tracy's relief column actually crossing the ford of the Weiwei river on the same day as we reached Ngaboto. After several days' rest here the combined columns returned to our base at Save—Captain Ferguson and Lieut. Hanbury Tracy proceeding over the Chemorongi mountains, whilst Lieut. Bright and I proceeded south to Marich, to return our Suk guide to his home and to complete the survey of this region. From Marich we followed the route of the previous year to Save by the Muroni river valley. We reached our base on November 12, after an absence of three and a half months, during which time we had accomplished a journey of close on 850 miles.

Before the reading of the papers, the PRESIDENT said: We have the great pleasure this evening of welcoming amongst us Colonel Macdonald and several members of his staff, who, as we all know, have done a very great service in Africa, and a very hard and difficult service. It is not every exploring party which has to fight for nine months before it can begin its work. Colonel Macdonald has led his expedition into countries which are entirely unknown to the north of Mount Elgon, and will give us a very interesting account of it.

After the reading of the papers by Colonel Macdonald and Major Austin, the following discussion took place:—

Captain PRINGLE: This is the first occasion, I think, we have had the pleasure of hearing Colonel Macdonald tell us something of his exploration work in Africa, and there may be some here to-night who perhaps do not know that Colonel Macdonald has done other and as valuable work in former years as that he has told us of to-night. In 1891 he went out in charge of the Uganda railway survey. He never has had an opportunity of telling us of the work he did in connection with that survey, but the railway is now working along the line that he surveyed, and I think that, though he has very modestly not said anything about it, we shall all be glad of this opportunity of expressing our admiration of his railway survey work in East Africa. I should like to mention one point in connection with the exploration work of other and famous explorers, more particularly in respect to Captain Speke. Colonel Macdonald has not referred to Captain Speke's work, but I think that he and other African explorers recognize, considering the instruments and material at Captain Speke's disposal, how extraordinarily accurate his work was. I should like to mention one other point about Colonel Macdonald's work. Next Monday we are to hear a lecture by Captain Smith, who was with the late Captain Sclater on the construction of the cart-road between Mombasa and Uganda. I believe those two officers of the Royal Engineers carried on a trigonometrical survey between the coast and Lake Victoria Nyanza. I think you will recognize the accuracy of Colonel Macdonald's work when I say that the result of that survey is to show that the position of Mumia's, 600 miles from the coast, as fixed by Colonel Macdonald in 1892, is within a few hundred yards of the position determined by this more accurate trigonometrical survey.

Mr. ERNEST GEDGE: I must confess it is with diffidence I rise to address you, as

it is so many years since I had the pleasure of seeing Africa. In 1890, in company with my friend Mr. F. J. Jackson, I ascended Mount Elgon, and from there we surveyed, or rather looked over, the country which Colonel Macdonald has been fortunate enough to traverse for the first time. Much as we should have liked to have prosecuted our investigations further, we were unable to do so for many reasons. In the first place, the hostility of the natives was very great; there was famine everywhere round about, and there was no water. I wish to bear tribute to the cordial relations which I have always had with Colonel Macdonald in the days of old in Uganda, and to the universal respect in which he was held as an officer, and as a man able to lead men.

Major MAXSE: My expedition, under the Sirdar's orders, was made last December up the Sobat river, which flows into the Nile 80 miles above Fashoda. Our object was to take over the region of the Sobat (which was formerly held by the Egyptians), and to communicate, if possible, with Colonels Martyr and Macdonald in the upper Nile and in the Lake Rudolf district.

I sent off several letters in December, 1898, and, for all I know, these may be still wandering about the country in charge of various naked black gentlemen on the look-out for the gallant colonels. But, as Colonel Macdonald has just told us that he quitted the Latuka country in October, the chances are he may never receive my interesting communications. Of course, you will not expect me to tell you much about the Sobat district in a five minutes' oration, especially as I came here without a suspicion that I should be called upon to address you. The river undoubtedly affords us a fine waterway into the country. Our gunboat, the *Abu Klea*, navigated the Sobat for nearly 300 miles, and also one of its southern tributaries for another 108 miles, viz. to a point 320 miles from the Sobat mouth, on the Nile.

I calculate that the *Abu Klea* was between 150 and 160 miles from Bor when she reached the farthest navigable point of the above-mentioned southern tributary, called the Pibor. Onwards towards Bor the country consisted of marsh land and grass land, without a visible hill or the sign of a habitation. There is but one cluster of villages on the Pibor river, containing some six to seven thousand inhabitants of the Nuer tribe, with whom we entered into friendly intercourse. They have no communication with any tribes to the south. You will thus realize how difficult it was to get even a letter across to the upper Nile. To have organized a land expedition of sufficient strength to be of any use to our friends from Uganda would have required time, careful preparation, and quantities of supplies in such a barren land. Bor was reported to be occupied by 1000 dervishes under Arabi Dafalla.

In conclusion, I may say that there is still a wide field for further exploration in the Sobat district, which is well populated between the Nile and Fort Nasser, where we established a garrison.

The tributary marked "Juba" on most existing maps must have been put in by hearsay, as nothing like it exists. However, Major Capper mapped the whole country which our expedition traversed above Nasser; the maps are already in print, and they will doubtless soon be in your hands. I understand that previous to our visit the Pibor had never been explored or mapped, unless a flying visit of the French in 1898 was enabled to map a portion of it.

Colonel Sir THOMAS HOLDICH: I think, from what we have heard to-night, that we may all very well congratulate ourselves on having Colonel Macdonald here to receive our congratulations. We have waited for him so long; dimly and vaguely we have watched the operations of that little party which he commanded in that far-off country, obscured as they have been by the mists of distance, and sometimes

even by the smoke of those remote battlefields, and I think I may say this—whatever may have been the interest with which we have followed the march of the victorious armies from Cairo to Khartum, our hearts and sympathies have been quite as much with that little band of Europeans, Sikhs, and Swahilis who first of all had to save a kingdom, and then make their way northwards to the Nile, as with the heroes of Atbara and Omdurman. To-night Colonel Macdonald has given us an outline of what he has seen. It is but an outline, and we shall have to wait with patience until the time comes when he will be able to fill it in with the details of that mass of scientific information he has gathered together. There are one or two things which I should like to refer to. It is hardly the time, and this is not the place, in which to refer to those thrilling episodes that hang about the story he has yet to tell of his unequal fight with a savage foe, well armed and well disciplined. We have seen a good deal of that sort of fighting lately in other countries—some in India; and although this is no new phase in the art of war, there are new developments in it that will give cur military leaders some trouble and food for reflection. I wish to call your attention to the importance of the geographical discoveries made by the party under Colonel Macdonald. The discovery—we may accept it as such—of the extension of that Abyssinian watershed (the same which we crawled slowly down from Annesley bay to Magdala in 1868), an extension in the form of a plateau 5000 to 6000 feet high, bordering those huge swamps, which are so closely packed with vegetation as to make it impossible to navigate them; this must have an important bearing on our future communications in Africa. What the rôle of that watershed may be hereafter in the general scheme of African railways, it is impossible to say, but it is bound to be an important one. I should like to say a word or two, also, for those scientific survey methods which have been introduced by Colonel Macdonald into this strange land of mountains, deserts, and forests. The early explorers laid down a ground-plan, which had to be filled in by practical engineers, railway-makers, road-makers, miners, and general civilizers who have followed after them. Their methods and their system of geographical survey were not in all respects adequate for present requirements. Africa is such a vast country, and there is before us now such a vista of boundary settlements and land agreements to be made there, that we cannot afford any longer to be inaccurate in our geography. Thus it is a great thing to be able to welcome a somewhat new departure in this respect. The ultimate and ideal basis of a general survey of Africa, which every surveyor would wish to see, is a geodetic triangulation. This does not exist at present, and it certainly will be many years before it does exist; but, meantime, there are methods which, properly applied in skilful hands, will answer all practical purposes if duly recognized and properly attended to. It is exactly in the application of these methods that the scientific training of such men as Colonel Macdonald and Major Austin comes in. They have shown us once again in Africa that, no matter whether fighting or exploring, whether marching daily by rapid marches or sitting still, it is always possible to keep in touch with scientific accuracy in the matter of geographical map-making. There is one point which has struck me during the reading of Colonel Macdonald's paper. It is impossible, it seems to me, for any officer who is burdened with the responsibilities of leadership to be his own topographer. He cannot, in addition to his other duties, undertake the daily grind of making maps. For this he ought to be dependent on some trained agency which may be applied to that object, and that alone. Such we have in India in the native surveyors of the Survey Department. They have gone far and done well, even beyond the borders of Asia, and, so far as I know, they have always done good work. I have never heard anything but good of them. It is just such a school as this that is wanted in Africa. Here again

we must look to trained engineers of the stamp of Colonel Macdonald and Major Austin to initiate and support the scheme. Once again I say it is difficult to appreciate, by the light of this one evening's discussion, the magnificent work which Colonel Macdonald has succeeded in accomplishing. Colonel Macdonald and Major Austin and the gallant men with them may not, perhaps, claim the honours of first discoverers, such honours, that is to say, as were won by Speke, Grant, Baker, and Livingstone; but their names will at least stand high on the later roll of fame as African workmen, a roll of which England may very well be proud, for it includes the names of Gordon, Kitchener, and Lugard.

The PRESIDENT: It remains for us to pass a vote of thanks for the paper that has been read to us this evening. I am sure we must all have been struck by the remarkable steadfastness with which Colonel Macdonald and his staff have worked until they had accomplished what they intended to do. You will remember, I think, not much more than a year ago, how Mr. Cavendish told us of the extensive view he had attained from Mount Lubur of the region between Lake Rudolf and the Nile, and how it appeared to us to be an utterly unknown country. Well, Colonel Macdonald and his officers have traversed that unknown country, have discovered its characteristics, have measured its mountains, and had intercourse with its people. It must be a great satisfaction to them to have completed such excellent work. There, of course, is one great drawback in the loss of their companion, Captain Kirkpatrick. I remember well his coming to me before he went out, and what zeal and enthusiasm he showed for the task. Now Colonel Macdonald has told us that that zeal and enthusiasm were coupled with excellent work in the field. He was a clever surveyor, and an admirable commander of men. I cannot help expressing my deep sympathy to his family, with whom I am acquainted, for the loss they have sustained, and we have all heard how deeply it has been felt by Colonel Macdonald, his commander, and by his companions. Otherwise the expedition seems to have been an entirely happy and successful one. The work along the west side of Lake Rudolf to the river Omo was most complete, and has resulted in the laying down of that side of the lake by accurate survey. The examination of the mountains between that lake and the Nile has also been most valuable. We must all congratulate Colonel Macdonald and his gallant and zealous companions on the completion of their most arduous labour, and I am sure you will all unanimously pass a vote of thanks to him for his paper this evening.

THE SWEDISH ARCTIC EXPEDITION OF 1898.*

By Prof. A. G. NATHORST.

WICHE'S LAND.

In what I have said up to this point, I have avoided the delicate question how far King Charles Land is to be identified with the land which the Englishman, Thos. Edge, alleges to have been seen in 1617 to the east of Spitsbergen, and which he calls Wiche's Land. The identification of the two has been strongly maintained by English geographers, whilst Petermann in his day as stoutly disputed it. The story of the discovery of Wiche's Land, which was communicated by Edge himself, is

* Map, p. 128. Continued from p. 76.

recorded in the second chapter of the third book of Purchas.* Edge was at that time commodore of the English flotilla which the Muscovy Company despatched every year to Spitsbergen (although then called Greenland). The salient passage (p. 467) runs as follows:—

"They also employed a ship of sixtie tunnes, with twenty men in her, who discouered to the Eastward of *Greenland*, as farre to the Northwards as seuentie nine degrees, and [?] an Iland which he named *Witches* Iland, and diuers other Ilands as by the Map appeareth, and killed stores of Sea-horses there, and then came into *Bel-sound*, where he found his lading of Oyle, left by the Captayne which he tooke in."

From this passage, as well as from the context, it is plain that Edge himself did not see the reputed land. The accompanying map (see Fig. 17, a reduced facsimile) represents Wiche's Land as a coast extending over two and a half degrees of latitude in a north-south direction. In reply to Petermann's observation, that Wiche's Land has not on this map the same position as King Charles Land, it has been said that "the error of the draftsman in placing the land too far south is corrected in the accompanied text of Purchas; and this fact destroys the last shadow of an excuse for altering the name." †

For my own part, I should not hesitate one moment to use the English name, if I were only convinced that the English opinion answered to the real facts. But as it is, I have been forced to the very opposite conclusion. Instead of the text serving as a corrective of the map, it actually refers us to the map as its authority, saying, "as by the Map appeareth." Indeed, according to my interpretation of the text, there does not exist any discrepancy between the text and the map, for I believe it only to be meant that the newly discovered land extends northwards, as far as about the 79th parallel. And in this interpretation I am strengthened by what I read with regard to the discovery of Edge Land in the year preceding: "They imployed this yeere a small Pinnasse vnto the East-ward, which discouered the East-ward part of Greenland, Namely, the Iland called now *Edges* Iland, and other Ilands lying to the North-wards as farre as seuentie eight degrees." But, as will be seen from the map, the southern extremity of Edge's Land lies on 77° N. lat., and it is to be assumed that the land which was discovered by the "pinnasse" extended at least as far north as 78° N. lat.

Be this, however, as it may, it was the most natural thing in the

* 'Purchas his Pilgrimes,' pt. iii. London. 1625.

† 'Ocean Highways,' New Series, i. (1873–74) p. 19. The controversy may be read in *Petermanns Geographische Mitteilungen*, 1873, p. 129; and 1874, p. 38, note 2; *Proc. Roy. Geog. Soc.*, vol. xvii. (1872–73) p. 97; 'Ocean Highways,' *loc. cit.*, pp. 19, 34, 465. The March number of the last-cited work for the year 1873, which is also said to throw some light upon the matter, is. unfortunately, wanting in our Swedish

world for the English geographers, when they learned that Von Heuglin had discovered a large extent of land lying to the east of Spitsbergen, and between 78° and 79° N. lat., to regard this as identical with Wiche's

FIG. 17.—PURCHAS'S MAP OF SPITSBERGEN AND WICHE'S LAND.

Land. But the accuracy of their identification was obviously very greatly weakened by the observations made in 1872, by which it was shown that the King Charles Land of Von Heuglin did not exist, and that the real King Charles Land (of Mohn) is considerably smaller than the reputed Wiche's Land. Unfortunately, Kükenthal's map, upon which the latest English Admiralty chart has been constructed, by making Swedish foreland three times the size it ought to be, lends a fictitious support to the English identification. We now know, however, that Swedish foreland is not more than 11′ (lat.) long, or, in other words, stretches in a north-south direction only about one-fourteenth of the distance which is assigned to Wiche's Land on Edge's map, and that at a different longitude; and therewith vanishes the last glint of likelihood that King Charles Land is identical with Wiche's Land. Nor must it be overlooked that Wiche's Land, as depicted on Edge's map, presents a totally different outline from the real contours of King Charles Land. To identify the two, therefore, is, in the light of these difficulties, impossible.

What, then, is Wiche's Land? Scoresby thought * it was the same as Ryk Yse's islands. But this is scarcely likely, for Kükenthal has shown that these islands are exceedingly small—in fact, considerably less than they were generally believed to be. Possibly it was a mirage which gave rise to the mistake, similar to that which misled Birkbeck and Von Heuglin and Von Zeil, and which originated the long discussion as to the relation between King Charles Land and Wiche's Land. In this connection it is important to remember Payer's mistake with regard to Franz Josef Land, a mistake which came near to costing Nansen dear. Now, if mistakes of this kind could be made in these present days, and made by experienced explorers, it is readily conceivable that they may have also been made in former times, and this despite the strange prejudice which leads men to believe that the older an account the more trustworthy it is. On the whole, there is no impossibility for concluding that the seamen who were under the impression that they saw the so-called Wiche's Land, were in reality the victims of an optical illusion.

All the same, there does exist another assumption, and it is this, that Wiche's Land and Edge's Land may be the same. The latter was discovered in the year 1616, and on the map is placed much too near to West Spitsbergen (Greenland). Now, it is not inconceivable that, if in the following year another seaman discovered to the east of West Spitsbergen land which lay too far to the east to agree with the pretended position of Edge's Land, he should naturally conclude it was not the same, but an entirely fresh discovery; and, as a matter of fact, the outline of the coast of Wiche's Land does bear a certain resemblance to the

* 'An Account of the Arctic Regions' (Edinburgh), vol. i., Appendix No. 3, p. 62: "1617. Wiches Land, afterwards named by the Dutch Ryk Yse's islands, discovered by one of the English whale-fishers."

east side of the Great fjord. In that case, the sound on the map which almost divides Wiche's Land would obviously be that which on Edge's map is called Ald. Freman's inlet.

There is also another circumstance in the map published by Purchas which seems to favour this hypothesis, namely, that the three islands which are there shown to the south-south-west of Hope island have no actual existence. If, however, we accept the hypothesis that Wiche's Land and Edge's Land are one and the same, it becomes quite easy to account for their appearance on Purchas's map, for they then simply correspond to what are now called the King Ludwig islands. However this may be, it is abundantly clear that for the future the name Wiche's Land must disappear from our maps.

Map-making of the 1898 Expedition.

The map of King Charles Land, which was laid down as the result of the labours of the Swedish Polar Expedition of 1898 (see *Ymer*, 1899, pl. 1, and the map accompanying this paper), was drafted by the official cartographer of the expedition, Lieut. O. Kjellström. Swedish foreland is mapped from Lieut. Kjellström's own survey with plane-table, levelling telescope, and offset pole, which he used in the course of a peregrination of the entire island. He also measured in the same way the western upland region of King Charles Land, as well as the eastern portions around Mount Johnsen and westwards as far as Timmer ness. The low grounds in the middle of the island, as also Abel island and other small islands, were laid down through the photogrammetrical method by Dr. A. Hamberg. The latter likewise took and calculated all the astronomical determinations we made, and determined the variation of the compass both upon Swedish foreland and upon King Charles Land.

The altitudes are based partly upon observations with Elfving's mirror, made by Lieut. O. Kjellström, and partly by barometrical observations taken by Messrs. Hamberg, G. Andersson, J. G. Andersson, and the writer of this paper. With regard to the former set of observations, it should be stated that they seldom give the highest altitudes of the tableland, for the simple reason that these were not visible from the places from which Lieut. Kjellström took his observations, but the difference cannot be great. The dotted contours of the small islands and the low-lying portion of the coast were only seen from a distance; hence it seemed desirable to distinguish them from those portions of the coastal outline which are laid down from actual measurement. I dare say such errors as exist in these dotted stretches of coast will not eventually be found to be very serious.

Since this paper was originally written, but before the map which accompanies it was printed, I have seen Captain Rüdiger's account of

the German Lerner expedition.* Thus I am able to incorporate in my map the names Helgoland island and Tirpitz island. But Rüdiger's Mount Emmy and Mount Martha are the same as Hårfagrehaugen and Mount Johnsen respectively. Rüdiger's altitudes are without exception erroneous. Whilst on the one hand he makes several elevations twice as great as they ought to be—for instance, Mount Mohn 1500 to 2000 feet, and the western side of King Charles island 1300 to 1500 feet—on the other hand he puts Mount Johnsen at only 350 feet, or less than one-half of its real height.

Since the maps of the Swedish expedition of 1898 were laid down partly by the older method, employed by Lieut. Kjellström, and partly by the newer photogrammetrical method, employed by Dr. A. Hamberg, it may not be out of place to add a few words as to the way in which these two methods are used in relation to one another. I cannot but consider it fortunate that we had gentlemen on board who were capable of using both.

At both Bear island and Swedish foreland it was found impossible to employ the camera, because of the prevalence of mist. Had we been confined to the photogrammetrical method alone, we should consequently have been doomed to disappointment. As it was, we were fortunate enough to obtain excellent results with the old-established instruments. The results obtained by this method are very reliable, and after taking a clean tracing there remains little more to be done. On the other hand,.the work in the field is very much more laborious than by the newer method, and consequently it takes a proportionally longer time to get the map completed. It was, therefore, fortunate for us that during the time of our stay at King Charles island we enjoyed days sufficiently clear to admit of excellent photographs being taken of the low grounds of the interior, as well as of the small islands round the coast. Afterwards the weather became so changeable, that it is extremely doubtful whether we should have been able to lay off such a dangerous coast long enough to allow of the island being surveyed by the more usual method. If you are not pinched for time, and can afford to wait for fine weather, the photogrammetrical method is by far the more convenient, although a considerable time must necessarily elapse afterwards before the map can be finished. We mapped the whole of Van Keulen bay in Spitsbergen by this method. If you are making a reconnaissance, and are obliged to do your best no matter what the weather is, you cannot dispense with the older, slower method; but if you are also equipped with camera, etc., you can take advantage of any fine days that may chance to come, and in that way can in a few hours accomplish as much as could be done in several days with the plane-table and other surveying-instruments.

* 'Allgemeines über den Verlauf der Expedition nach dem europäischen Nordmeer an Bord des Dampfers Helgoland,' in *Verhl. d. Gesch. für Erdkunde zu Berlin*, xxv. (1898), p. 430.

GEOGRAPHY OF KING CHARLES LAND.

As will be seen by a glance at the map, the framework of Swedish foreland consists of a tableland or plateau, stretching in a general north-south direction throughout the island. Its southern end, culminating in Mount Nordenskjöld (Fig. 18) is tolerably broad. The plateau is capped with basalt, resting upon sedimentary strata (sand, sandstone, and clay) of the Jurassic system, which become visible in the steep slopes which front the ocean at the southern end of the island. The highest altitude on this plateau, by barometric measurement, is 625 feet. Going northwards, the plateau gradually contracts in width to a narrow ridge, the Keel (Kölen); this again, as it advances to the north, widens out into the plateau of Mount Dunér (755 feet), which is separated

FIG 18.—MOUNT NORDENSKJÖLD, ON THE SOUTH SIDE OF SWEDISH FORELAND.
(*From a photograph by O Kjellström.*)

from Mount Mohn (730 feet) by a depression. To the south of the Keel there exists a permanent cap of snow and ice, the Oval ice-cap. Except for this, and for the patches of snow which cling permanently to the upper edges of the plateau and the higher slopes of the hills, the island is tolerably free from snow. As I have already had occasion to remark, Kükenthal erroneously supposed that a snow-drift which he observed on the west side of Mount Nordenskjöld was a glacier. Lieut. Kjellström, however, reported the existence of an undoubted glacier with moraines on the east side of the island; on my map I have named it Kükenthal glacier.

As the snow-drifts melt, the water trickles down to the lowlands on both sides of the island, the low grounds on the east being relatively of considerable extent. These low grounds consist chiefly of sand and clay washed down by the rivulets, and, being marshy, are not easy to traverse. At Cape Weissenfels there exist veritable sand-dunes, a

somewhat strange phenomenon in the arctic regions. Of the raised beaches along the shore, and the great quantities of driftwood, I shall speak later.

Unfortunately, Swedish foreland does not possess any sheltered anchorage or port. As for the *Antarctic*, she was anchored in 7½ fathoms of water to the south of Cape Weissenfels, where she was to some extent protected against the northerly winds. The sea-bottom there was fine sand. According to the reports of sealing skippers, when the wind is in the south, it is possible to anchor on the north side of Cape Weissenfels. There is also believed to be an anchorage near Cape Pettersen. I thought there would be good anchorage between Cape Hammerfest and the little island of Antarctic which we discovered, but I was

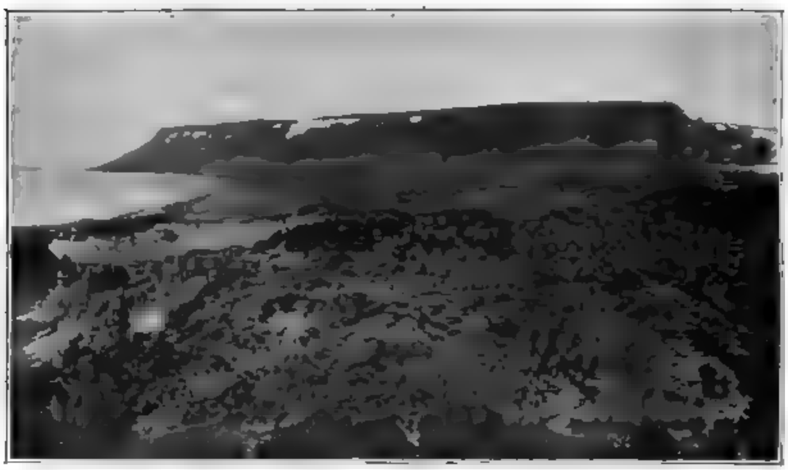


FIG. 19.—MOUNT SJÖGREN, SEEN FROM CAPE ALTMANN, LOOKING WEST.
(*From a photograph by O. Kjellström.*)

mistaken. The water was too shallow to allow of a vessel with such a deep draft as the *Antarctic* approaching sufficiently near to the island. No doubt sealing sloops and smaller craft might count upon sufficient shelter there, but they would have to proceed with great caution, and employ the lead constantly. Unfortunately, we were unable to take any soundings of real value.

King Charles island may be said to consist of three separate main portions—the western plateau or uplands, Mount Johnsen in the east, and the lowlying intervening ground between the two. The western plateau embraces three distinct parts—(1) Mount Sjögren (Fig. 19), which forms the southern side of the western end of the island; (2) Mount Tordenskjold (Fig. 20), separated from the former by the pass opposite to Cape Altmann, and running up on the north into the

similarly shaped Mount Retzius; and (3) Hårfagrehaugen, which stands isolated. Mount Sjögren is very narrow, especially as compared with Mount Tordenskjold.

To the geologist the history of the island is an open book. It is plain that these flat-topped mountains are the survivals of what were formerly extensive plateaus, and that they owe their survival to the great resisting power of the basalt as against the destructive agencies of erosion and disintegration. The basalt has played here the same *rôle* as the diabase on the summit of Kinnekulle, etc., in Sweden; it forms a protective cap to the soft and easily destructible sedimentary rocks which underlie it, and which, but for its protection, would long ago have entirely disappeared. The sedimentary sands, clays, and clay-

FIG. 20.—MOUNT TORDENSKJOLD, SEEN FROM CAPE ALTMANN, LOOKING EAST.
(*From a photograph by O. Kjellström.*)

slates belong to the Jurassic system, and we found in them a considerable number of fossils, both plants and animals, belonging to different subdivisions of the system.* Mount Mohn and Hårfagrehaugen, which have a certain resemblance to one another, have been separated from the plateaus adjacent to them by erosion. The latter is more completely detached than the former, for Mount Mohn is still connected in part with the plateau which lies to the south of it. Mount Johnsen, which stands isolated at the eastern extremity of the island, is built up in the same manner as the other plateaus: its summit consists of basalt, resting upon Jurassic strata richly fossiliferous. These capping

* I propose to publish in another place a detailed account of the geology of King Charles Land.

basalts were originally lava-flows, in the vesicular hollows of which crystals of agate, calcedony, rock-crystal, calc-spar, etc., have been formed. It is also possible that warm springs highly charged with silicic acid, the after-effects of volcanic outbreaks, have been the active causes of the petrifaction of the fossilized wood, which occurs so plentifully in conjunction with the basalt beds. The basalt is also met with in the form of dykes; *e.g.* Cape Altmann is one such dyke, and it is continued in a series of submarine ridges for a considerable distance seawards. For this reason, great caution should be observed in approaching the coast in this place.

The difference in altitude between the several plateaus cannot be said to be great, though the average elevation of the plateaus of King Charles island is higher than the average elevation of the plateaus of Swedish foreland. Mount Sjögren is about 820 feet high. Mount Tordenskjold reaches 460 feet in the south, but northwards runs up to 945 feet (or, according to the barometer, to 995 feet). Mount Retzius, with which it is connected, attains a yet greater altitude, viz. 1050 feet (barometric measurement); whilst Hårfagrehaugen is at least 1005 feet high. The mean of four independent barometrical observations gives the altitude of Mount Johnsen as 755 feet.

There exists a large snow-drift on the plateau of Mount Tordenskjold, on the east side, or rather it existed at the time of our visit in the early part of August; except for this, the tops of the plateaus of King Charles Land were, strange to say, almost entirely free of snow. But on their slopes, immediately underneath their edges, there exist several patches of snow, some of them, *e.g.* on the western versant of Mount Tordenskjold, a few miles long.

Apart from a few isolated rocks of basalt, the lower grounds are composed of disintegrated materials brought down from the hills and rearranged by the sea. These disintegrated materials consist of sand and stony clay, and, above all, of pebbles of basalt. Indeed, terraces of rounded basalt pebbles are conspicuous everywhere, but are especially strongly developed at Cape Hammerfest, on Swedish foreland, and throughout almost the whole of the lower grounds of King Charles island. Both Johnsen and Pike have called attention to these ancient marine terraces, which, I may add, occur as high as 715 feet above the present level of the sea, and traces of their former existence are met with at even higher altitudes. This is an extremely interesting fact, because, so far as has been observed hitherto, the changes of level which have taken place in Spitsbergen do not reach above half as high. Another remarkable circumstance in connection with these ancient marine terraces—a circumstance duly pointed out by Johnsen and Pike—is the occurrence of driftwood at considerable altitudes above the present level of the sea. We observed driftwood at a level of at least 130 feet above the ocean; and, by the way, this affords striking evidence

of the slow rate of decomposition in those high latitudes, for the drift-wood which lies at such a great height must be several thousand years old. In a few places we saw lying on these marine terraces, and also up on the summits of the plateaus, erratic blocks which had been transported thither by drift-ice; they were sometimes of granite, sometimes gneiss, or quartzite, and on the lower eastern part of King Charles island white limestones belonging to the Permo-Carboniferous Age, similar to those which prevail in certain mountains that overhang Hinlopen strait in Spitsbergen.

According to J. G. Andersson, there exists a small glacier on King Charles island, on the southern slope of Mount Tordenskjold; but possibly it is a "dead" glacier. In the immediate vicinity, the investigator discovered some striated stones. This glacier and Kükenthal glacier on Swedish foreland were the only two glaciers that we observed, though there existed other evidences of former glacial activity on King Charles island. But with regard to this, I intend to publish an account elsewhere.

As on Swedish foreland, so on King Charles island, there exists a small ice-cap, the Round ice-cap. The former was crossed by myself and Hamberg, the latter by Hamberg alone. The process of thawing which they were undergoing presented more than one feature of interest, such as cylindrical melting-holes (cryoconite holes) of different sizes, though these are also found on other permanent snow-drifts. When we visited King Charles Land, it was the time of year when the red and green snow was beginning to show itself. The latter variety seemed to me to be especially prevalent where the substratum consisted of inorganic materials. At least I never saw the snow so deeply stained with green as I did in a certain locality on the east side of Mount Nordenskjöld on Swedish foreland, and in another similar place on the east side of Mount Tordenskjold on King Charles island, and in both places the green snow rested on an inorganic base.

King Charles island, too, appears to lack good harbours. Our first anchorage was in Broad bay, on the east side of Cape Altmann, quite close to the shore, in 6½ fathoms, and there we were, to some extent, sheltered from the north and west winds. But the bottom being fine sand, the anchorage was not of the best; in fact, the blasts from the north sometimes swept over the hills with such violence that the shelter became entirely illusory. We also cast anchor in Antarctic bay, to the west of Cape Altmann, in 6 fathoms of water; but there too the "hold-fast" is only sand, though more shelving. The whole of Broad bay is full of islands and shallows. Although the bottom of Andrée bay is of clay, yet it was so deep—33 fathoms quite close to shore—that we did not venture to let drop an anchor, but lay to. Still, it might be possible to find a better anchorage in that bay. Whether there exist any more convenient anchorages in the small bays on the north side of the island,

I am unable to say. It might be worth while to examine some of them, *e.g.* Holm bay, with a view to finding out this.

The higher plants are but scantily represented in King Charles Land, although there were a few places which presented a very agreeable contrast to the prevailing barrenness. The flora embraces but few species. The three botanists of the expedition found hardly more than about a score of phanerogams altogether. Their names, and the localities in which they were discovered, are indicated in the subjoined list, extracted from the *Proceedings* of the Royal (Swedish) Academy of Sciences (1898, p. 555).

LIST OF PHANEROGAMOUS PLANTS FOUND IN KING CHARLES LAND BY THE SWEDISH POLAR EXPEDITION OF 1898. BY GUNNAR ANDERSSON AND HENRIK HESSELMAN. (CERTAIN OF THE PARTICULARS HEREAFTER RECORDED ARE DUE TO PROF. DR. A. G. NATHORST.)

1. *Saxifraga nivalis*, L. On Swedish foreland, as well as King Charles island.
2. *Saxifraga nivalis*, L., var. *tenuis*, Wg. In dry places. This variety, like the type of the species, occurs on both islands.
3. *Saxifraga stellaris*, L., var. *comosa*, Poir. In moist places. On both islands.
4. *Saxifraga oppositifolia*, L. On both islands.
5. *Saxifraga rivularis*, L. In various localities. On both islands.
6. *Saxifraga cernua*, L. In large numbers at Cape Weissenfels, in the east of Swedish foreland; also thinly scattered over both islands.
7. *Saxifraga decipiens*, Ehrb., var. *cæspitosa*, L. On both islands.
8. *Cardamine bellidifolia*, L. A few solitary examples on both islands.
9. *Draba* sp. Scattered thinly over both islands. Perhaps two separate species.
10. *Cochlearia fenestrata*, R. Br. Occurs on both islands. Especially abundant at the sandy Cape Weissenfels, in the east of Swedish foreland. Several varieties.
11. *Papaver radicatum*, Rottb. (*P. nudicaule*, L.). On both islands, in full bloom.
12. *Ranunculus hyperboreus*, Rottb. On the marshy ground at Cape Hammerfest, in the south of Swedish foreland, and in the vicinity of Broad bay on King Charles island. Not found in flower.
13. *Ranunculus sulphureus*, Sol. On both islands.
14. *Stellaria longipes*, Goldie, var. *humilis*, Fenzl. On both islands.
15. *Cerastium alpinum*, L. On both islands.
16. *Cerastium alpinum*, L., var. *cæspitosa*, Malmgren. On both islands.
17. *Alsine rubella*, Wg. Only a few specimens at Cape Hammerfest, in the south of Swedish foreland.
18. *Sagina nivalis*, (Lindbl.) Fr. At Cape Weissenfels, in the east of Swedish foreland.
19. *Polygonum viviparum*, L. In the south of Swedish foreland.
20. *Salix polaris*, Wg. On both islands.
21. *Poa flexuosa*, Wg. On both islands.
22. *Poa* sp. From the sandy Cape Weissenfels, in the east of Swedish foreland.
23. *Catabrosa algida*, (Sol.) Fr. On both islands.
24. *Alopecurus alpinus*, Sm. On both islands. Occurs in various localities, and often of luxuriant growth.
25. *Luzula arctica*, Blytt. On both islands.
26. *Luzula arcuata*, (Wg.) Sw., subsp. *confusa*, (Lindeb.) Hartm. At Cape Weissenfels on Swedish foreland, and beside Broad bay, in King Charles island.
27. *Juncus biglumis*, L. On the north side of King Charles island.

No species of vascular cryptogams were found. A more detailed description of the general botanical relations of the archipelago, especially of the exceedingly interesting flora of the sandy shore and the sand-dunes of Swedish foreland—a flora that has not been observed anywhere else in such high arctic latitudes—is reserved for another occasion.

Here I may add that *Silene acaulis*, which Mohn, on the strength of Johnsen's description, assigns to this archipelago, is undoubtedly *Cerastium alpinum*, var. *cæspitosa*. Future explorers will no doubt discover a few other species; still, I do not think they will find that many have been overlooked by our expedition.

The drift-sand flora of Cape Weissenfels is indeed of very great interest. In no part of the arctic regions have I seen the mountain poppy either so fully developed or so profusely in bloom as I saw it in Swedish foreland. In one place a tolerably large hill was so closely carpeted with its yellow flowers, that at the first glance I thought it was a new variety of stone, different from the varieties in the vicinity. As is generally the case, the hillsides and the level ground immediately at their feet offered the richest flora. As Mr. Pike pointed out, the terraces of basalt pebbles are almost entirely destitute of plants of the higher orders; in this respect they resemble the so-called "stone-fields" of Sweden.

The chief features of the mammalian fauna and the avi-fauna of King Charles Land were described by Johnsen; since his time, contributions have been made to our knowledge of this department of science by Kükenthal and Pike. The polar bear, arctic fox, and reindeer were named as the three principal terrestrial mammals; but the reindeer would now appear to be extinct. In 1872 Johnsen shot, on the east side of King Charles Land, "a buck, which for the region of Spitsbergen was of an unusual size, and had a magnificent crown of antlers," and on the surface of both snow and bare earth he perceived numerous tracks of reindeer and their calves. In 1889, Hemming Andreasen shot three reindeer on Swedish foreland; but since then, so far as is known, no reindeer have been seen on any of the islands of King Charles Land. I do not know whether they have been exterminated by the sealers, for of their doings we possess no records. If not, what is the cause of their disappearance? For the present this question cannot be answered. We came across reindeer horns in many places on both King Charles island and Swedish foreland; and on many of the permanent snow-drifts on the plateau in the latter island, we observed reindeer droppings in such quantity as to justify the assumption that reindeer must formerly have frequented the island in considerable numbers.

We saw the arctic fox on both islands, though only a few individuals. We shot three polar bears. Lieut. Kjellström, however, saw several on Swedish foreland, but was prevented by his duties from pursuing them.

Their tracks were visible everywhere; but as only a few days before a German expedition had slain no fewer than twenty-eight full-grown animals and captured four young ones, it was not surprising that there were but few left. The holes which the bears made in the snow were almost invariably on the upper slopes, immediately below the brink of the plateau. Their droppings consisted of grass and other vegetable matter.

Johnsen mentions three kinds of seal—the great seal, little seal, and Greenland seal. The presence of the latter will, of course, depend upon the presence of drift-ice. We saw no Greenland seal. To these may be added the walrus, of which some were killed by the Norwegian whaling skippers. Mr. Hamberg found a skull of a walrus in a raised beach at Cape Weissenfels.

Johnsen enumerates ten species of birds as existing on King Charles Land; Kükenthal mentions nine, and of these two are not contained in Johnsen's list. Kolthoff's list, on the other hand, embraces eighteen species; and if to these we add the long-tailed duck, which Kükenthal observed on June 24 about 6 nautical miles from King Charles Land, we get the following species:—

I. Those which certainly do breed on the islands—*Plectrophanes nivalis*, *Tringa maritima*, *Anser* sp. (presumably *brachyrhyncus*), *Somateria mollissima*, *Colymbus septentrionalis*, *Uria grylle*, var. *Mandtii*, *Lestris crepidata*, *Rissa tridactyla*, *Larus glaucus*, *L. eburneus.** That geese visit the archipelago was proved by an old egg-shell which I picked up on the eastern slope of Mount Johnsen, and by their droppings, which we observed in various localities; but the birds had migrated to other regions before the period of our visit.

II. The following possibly breed in King Charles Land: *Somateria spectabilis*, *Harelda glacialis*, *Lestris Buffoni* (on Swedish foreland), *Sterna arctica*, and *Charadrius hiaticula*.

III. The following do not breed in King Charles Land: *Lestris pomarina*, *Fulmarus glacialis*, *Uria Brünnichii*, and *Mergulus alle*.

As regards insect life, it must suffice to mention the occurrence of midges (*Chironomus extremus*, Holmgr., according to Prof. Chr. Aurivillius) and Podurids (glacier fleas, etc.).

* Mr. Pike speaks of this species as breeding on Cape Weissenfels. It is, therefore, an error on the part of Captain Rüdiger to say that the Lerner expedition, which discovered the ivory gull nesting on Abel island, was the first to note the occurrence of the bird on King Charles Land. Kolthoff found the ivory gull nesting at several other places besides Cape Weissenfels; for instance, on Mount Sjögren and Mount Retzius on King Charles island. We found the ivory gull also breeding on White island. Mr. Jackson, too, has reported the existence of a large breeding colony on Cape Mary Harmsworth, in Franz Josef Land; and Captain Kjeldsen saw great numbers breeding on an island off Cape Oppolzer, in the same archipelago (see *Ymer*, 1898, p. 240).

Conditions of Ice.

I ought not to omit some mention of the conditions of the ice at King Charles Land. As I have already said, the condition of the ice to the east of Spitsbergen would seem to have been exceptionally favourable in the summer of 1898. During the whole period of our visit of King Charles Land, the sea was completely free from ice. It is true that in the end of June, the ice to the east of Edge's Land prevented us from approaching King Charles Land; but some weeks later that ice was so far diminished that on August 3 the *Antarctic* was able without difficulty to cut her way through it, and this notwithstanding that on the day before the *Princesse Alice*, belonging to Prince Albert of Monaco, was stopped by it in 77° 30′ N. lat. and 26° 5′ E. long.* All the sealing skippers to whom we spoke were agreed that they had never seen so little ice to the east of Spitsbergen as in the year 1898.

Each of the immediately preceding years was also favourable in regard to the relatively small quantity of ice in the same region. This was particularly the case in the latter part of the summer of 1897, when Mr. Pike sailed from King Charles Land and came down the east side of Spitsbergen without meeting any ice; and in the same year, when the *Windward* fetched the Jackson expedition from Franz Josef Land, she was able to steam almost in a straight line from Cape Mary Harmsworth to Bear (Beeren) island.† In certain years in the eighties, too, the ice would appear to have presented unusually favourable conditions —for instance, in 1884, 1886, and 1889; and the same thing was true in 1872. But previous to the last-mentioned year, the ice conditions were of a very different character. What that was cannot, perhaps, be more succinctly expressed than in the words which an old Norwegian arctic navigator once used to me: "At the time when I used to sail to Spitsbergen, we never thought of going to the east of that island; it was looked upon as absolutely impossible."

From this it would appear that during recent years the ice conditions of those waters have changed considerably for the better. Whether, if we were to go still further back in the century, anterior to the period to which the old Norwegian skipper was referring, the ice conditions were better again, I cannot venture to express any opinion. It would be an interesting study to gather together the various reports as to the condition of the ice to the east of Spitsbergen which have come down to us, and see how far from them it would be possible to draw any conclusions as to the changes which have taken place, and whether there exist any grounds for inferring that those changes have been in any

* *Comptes Rendus de la Soc. de Géogr. de Paris*, 1898, p. 344. From Rüdiger's account (*loc. cit.*), it would appear that the *Helgoland*, with the Lerner expedition on board, encountered no traces of ice whatever to the east of Edge's Land on July 22 and 23.

† See the map, 'Routes in the Spitsbergen-Novaya Zemlya Seas.' in the April number of this *Journal*, 1898.

respect periodical, or have moved in any definite direction. In default of such information, it would be idle to speculate as to the causes of the diminution in the quantity of ice which has taken place during recent years, as well as to attempt to draw any inference with respect to the future.

Giles Land.

It was originally my intention, upon leaving King Charles Land, to proceed to Franz Josef Land in search of Andrée and his companions; for when we put in at Advent bay, we were told—incorrectly, as it subsequently proved—that Wellman, making for the same destination, had been unable to get through the ice. Then on August 12 we spoke the steamship *Frithjof*, and were told by Captain Kjeldsen, that he had thoroughly examined the whole of the southern portion of Franz Josef Land as far as the ice would allow him. He had visited Mr. Leigh Smith's house and also Mr. Jackson's without discovering any traces of Andrée. Under those circumstances, much as I should personally have liked to make a trip to Franz Josef Land, I deemed it advisable to desist. I could not do anything more for Andrée than had been already done; moreover, the season was getting on, and we should run a risk of being caught in the ice to little or no purpose. Leaving King Charles Land, therefore, on the night of August 17, I thought it wiser to make for White island, or Giles Land, farther to the north.

Early on the morning of the 18th, we became aware of a peculiar vault of light, as it were, gleaming through the mist. As the morning advanced, this glittering brightness took on more and more the appearance of land; and the likeness was all the greater because we thought we could observe a perpendicular ice-wall at its foot. But the atmosphere grew thicker, and as it thickened what we took for a fractured ice-edge we believed now to be land, far, far away in the distance, and the light which we had noticed appeared to be nothing more than a cloud above it. But this was an error; all at once the mist parted, and there before us lay White island in all its remarkable beauty (Fig. 21). And of a truth rightly was it named; for it was glittering white from its highest summit down to the very edge of the sea. It was covered throughout with its soft mantle of snow; not a rock projected through it to break its spotless purity. The island rose in regular curves to an altitude of 600 or 700 feet, and was one continuous mass of ice and snow. The ice plunges down into the sea all round the island, and is quite inaccessible, being abruptly broken off at the water's edge, thus presenting a steep wall of ice to the waves, and forming in some places big cubical icebergs. I was instantly put in mind of Nansen's description of Hvidtenland, which White island no doubt resembles, as it also apparently resembles, though of course in miniature, the steep ice-walls of the antarctic continent.

The weather was wintry, with squalls of snow, and unfortunately never quite clear. With the sun shining upon it, White island must be a fascinating object. It is considerably larger than previous maps represented it to be, for we steamed alongside it all the afternoon and all the following night. In the evening we succeeded in effecting a landing on its extreme north-eastern point, where the precipitous ice-wall drew back and left a strip of shore free. But our landing had nearly proved disastrous to our good vessel; for whilst the boat party was absent, the drift-ice set in strongly towards the land. We only just escaped being caught fast in it. And on the following morning, when I went on shore on the south-west extremity of the island, the drift-ice again threatened to cut us off from the vessel. The promontory

FIG. 21.—GILES LAND, OR WHITE ISLAND.
(*From a photograph by A. Hamber.*)

upon which I landed was low, and consisted of granite and gneiss. On the low ground contiguous to it a great crowd of ivory gulls had their breeding-places.

It scarcely admits of doubt that White island is the land which Commander Giles saw in 1707. It lies on precisely the same latitude as the Giles Land of Van Keulen's map; the difference of longitude is not a matter of any moment.

Circumnavigation of Spitsbergen.

Having completed the circumnavigation of Giles Land on August 19, we pushed further to the north; but the ice grew rapidly more and more difficult, so that we were obliged to keep close to its edge and incline to the north-west. We had every reason to congratulate ourselves upon having such a stout vessel; with one less strong, we should have fared but ill. Our greatest difficulty came shortly after midnight on the

20th; but the *Antarctic* behaved splendidly: her stout prow cleft a sure road through the ice, and in the morning we reached King Charles XII. island (Fig. 22) and open water. This island is the extreme outpost of Spitsbergen towards the north-east, and has a fine appearance with its steep sides and truncated top. To the south of it lies a smaller island, the Drabant. The coasts of both islands were strewn with great quantities of driftwood.

After exploring these two islands—the kernel consists of primary rocks—we once more pushed on to the north, till we reached 81° 14′ N. lat. There we encountered the solid pack-ice—"the firm ice"—a compact, absolutely impenetrable mass. That was the highest latitude we

FIG. 22. CHARLES XII. ISLAND.
(*From a photograph by A. Hamberg.*)

reached. Had it been a few weeks earlier, we might have penetrated a considerable distance further towards the north. But for some time past the wind had been blowing steadily from the north, driving the pack-ice before it. After sounding, we turned and followed the edge of the ice towards the south-west.

The rest of the voyage may be told in a few words, as we had to do with places that are sufficiently well known. We kept to the west of the Seven islands, and, putting in at Treurenberg bay, remained two or three days in Hecla cove to overhaul and clean the boilers. Upon starting again, we made for Grey Hook, and then steering north-west till we met the pack-ice again in 80° 18′ N. lat. Thereupon we returned to Grey Hook, and thence steered for Virgo harbour, in Danish island.

There we made a vain search for dead carrier pigeons of Andrée's expedition, and filled up our water-tanks. Andrée's balloon-house was blown down (Fig. 23); still it was interesting to have seen the cradle, as it were, of a method of exploration which will no doubt be more extensively employed in the future. We next took a sounding north-west of Amsterdam island, and then turned our prow southwards, and on August 28 intersected our previous course of July 25, thus completing the first Swedish circumnavigation of Spitsbergen.

On the following day we were caught in a furious tempest, the wind having a velocity of 65 feet in the second. This threw us forty-seven minutes west of our true course. We put the *Antarctic* under close-

FIG. 23.—REMAINS OF ANDRÉE'S BALLOON HOUSE, DANES ISLAND.
(*From a photograph by O. Kjellström.*)

reefed topsail and fore-stay sail, and it was a real pleasure to see how splendidly she weathered the heavy seas. I should like to have gone into the Great fjord for a few days' geological field-work, but the storms succeeded one another thick and fast; winter had set in, so that in the end I judged it wisest to make for home. We passed Bear island on the afternoon of September 3, and thence steered straight for Tromsö, sounding and making hydrographical studies as we went. Upon putting into Tromsö on the morning of the 7th, we found nearly all the arctic sealing-fleet already arrived before us.

Sketch of the Scientific Results of the Expedition.

In the foregoing summary description of the course of the expedition, I have not been able to do more than touch *en passant* upon the scientific

work that we were able to accomplish. I will, however, endeavour to gather up some of the most important results, in so far as they have been already worked out or are of general interest. It will, of course, be some considerable time before all the material we brought home with us is duly digested and tabulated.

Speaking first of the *geographical* results, I may mention the mapping of Bear island, Bel sound, and King Charles Land, as well as the nearer determination of the extent of White island. Henceforward it would be desirable that this last should be known as Giles Land, which has thus, as it were, been definitively rediscovered. Nor was *geology* neglected. Bear island proved a particularly valuable field, yielding unexpected results of great value. King Charles Land was thoroughly studied, because its geology is of special interest as forming a connecting-link between Spitsbergen and Franz Josef Land. The geology of Spitsbergen was completed. We brought home with us numerous and comprehensive collections of specimens of rock and fossils.

Our *botanical* collections were not less complete. They embraced materials for the herbarium as well as specimens preserved in alcohol and formaline. To the botanist King Charles Land was hitherto a *terra incognita*, so that the collections we brought home from that group of islands possess a unique and valuable interest. Here I may also mention that we brought home numerous specimens of red snow and green snow, of soils, and of plant-seed. From Advent bay we sent home to the Botanical Garden of Stockholm fifty-two species of living plants, and these happily all arrived in good condition. We carried out biological investigations of the flowers, and studied the relations of different plants to temperature, moisture of the air, intensity of light, and so forth, as well as took a great number of botanical photographs. In conjunction with our botanical collections, I may here add that we brought home with us a large quantity of *driftwood*, gathered from various localities which we visited. Fig. 24 shows in what abundance driftwood occurs in some places.

Our *zoological* collections of both mammals and birds will, it is hoped, form the nucleus of an Arctic Biological Museum, which it is proposed to form, so as to afford the public an opportunity of studying arctic animal-life in the actual forms. Our avi-faunal collections are, I believe, very complete and the best preserved of any that have ever been gathered in those high latitudes. It is much to be hoped that this project of an Arctic Biological Museum may be eventually realized, because in probably less than a quarter of a century several forms of arctic animal-life will, it is to be feared, have become extinct.

Our zoologists made numerous interesting observations on the habits of life of the birds. In this place I will confine myself to saying that the female of the broad-nebbed swimming sandpiper (*Phalaropus fulicarius*) flies away from her nest as soon as she has laid her eggs, and

leaves the duties of incubation and the rearing of the young to the male. Agreeably with this, the plumage of the female is much handsomer than that of the male. The female of the purple sandpiper (*Tringa maritima*) likewise leaves her young ones, so soon as they are hatched, to the care of her mate.

With the trawl and scraper we obtained specimens of the deep-sea fauna in forty-two different stations, from depths varying from a few fathoms down to 10,335 feet. The results are very extensive, and embrace several forms of great interest.

As is well known, within recent years a good deal of attention has been directed to the study of plankton, the micro-organisms of the

FIG. 24.—SHORE OF AMSTERDAM ISLAND COVERED WITH DRIFTWOOD.
(*From a photograph by G. Andersson.*)

ocean, partly because of their own intrinsic interest, and partly because they form the principal food of the herring. During the course of the voyage we took close upon 150 specimens, most of them from the surface, though some came from depths between 1500 and 6900 feet, the greatest depths from which plankton has hitherto been taken in arctic waters.

In so far as our *hydrographical* labours were concerned, I have already adverted to our fresh soundings in the Swedish deep, proving that the previous soundings were in error in giving too great a depth for that part of the Northern seas. Altogether we made twenty-four different soundings, and collected specimens of the sea-water at each. One noteworthy result of this work was the evidence we obtained, that

at the present time the Gulf Stream seems to be spread out relatively wide and deep. I have already stated that we found it to be prevailing to the bottom in the entrance to Ice fjord. The same thing was also observed north of North-East Land, in 81° 14′ N. lat.; the water was 35°·6 Fahr. at the bottom of the sea—500 feet deep. With the view of ascertaining something of the extent and direction of the current of the Gulf Stream, we threw nine hundred bottles with printed post-cards into the sea; of these about a score have already been found on the coasts of Denmark, Norway, and Spitsbergen.

Magnetic investigations, including the determination of the variation of the compass, were carried out in more than half a score places.

Throughout the voyage *meteorological observations* were taken with self-registering barometers (barographs) and thermometers (thermographs), as well as with anemometers.

A unique series of experiments were made by the doctor of the expedition, who, on every favourable opportunity, carried out *bacteriological investigations*. He filtered the atmosphere in a score of different localities on Bear island, Spitsbergen, and King Charles Land, altogether a total of 4400 gallons; but in all this quantity he did not discover a single bacterium, and only an infinitesimal quantity of aspergillus, or mould. The salubriousness of the atmosphere in the polar regions has been long known; but this is probably the first time it has been systematically and exhaustively studied on the spot by an experienced bacteriologist. Nor did the doctor confine his investigations to the atmosphere; he also examined the fresh water, snow, and ice, as well as sea-water drawn from the depth of 8860 feet. The fresh water is not entirely free from bacteria, though they are present in infinitesimal quantities, about one bacterium in every 11 cubic centimetres (= 0·67 cubic inch). In the sea-water the quantity of bacteria appeared to increase directly with the depth. The bacteriologist further examined the intestinal contents of a number of different animals, but without, generally speaking, discovering any traces of bacteria. In the intestines of the polar bear and the seal he found a species of bacteria closely resembling that which exists normally in the intestinal canal of man; but, with the one exception of the burgomaster gull, every species of bird that was examined was entirely free of bacteria.

NOTE.

OBSERVATIONS UPON THE MAP OF KING CHARLES LAND WHICH ACCOMPANIES THIS PAPER.—The map was originally laid down on the scale of 1 : 100,000, but it was judged sufficient to reproduce it here on the scale of 1: 250,000.

In August, 1898, the variation of the compass at Cape Weissenfels, on Swedish foreland, was 1° 20′ W., whilst at Cape Altmann, on King Charles island, it was 2° 4′ E.

MEMORANDUM ON WICHE'S ISLANDS.

By Sir Clements R. Markham, K.C.B., President, R.G.S.

1617. "They also employed a ship of sixtie tunnes, with twenty men in her, who discovered to the eastward of Greenland, as far to the northwarde as 79°, an Island which *he* named Wiche's Island, and divers other Islands (as by the map appeareth") (Purchas). When the first person is used, Purchas is copying the report *verbatim*; but when Purchas begins with the third person, he is making an abstract in his own words.

The above words are *not*, then, written by Captain Edge himself, but by Purchas, with the report of Edge before him, of which he gives a meagre abstract. This, unfortunately, was the custom of Purchas, owing to want of space, instead of giving the full texts of reports.

The *he* is no doubt Captain Edge, or one of his captains, who commanded the ship of sixty tons, and discovered Wiche's Land in 79° to the east of Spitsbergen (then called Greenland).

It is Purchas, not Edge, who refers to the map, for which he is solely responsible, and which places Wiche's Land in a latitude differing from that given in Edge's report as quoted by Purchas. The size and wrong latitude of Wiche's Land on the map are merely blunders of Purchas's draughtsman. The quotation from Edge's report proves, beyond doubt, that he or one of his captains discovered land in 79° N. to the eastward of Spitsbergen, which he named Wiche's island.

The name ought, therefore, to be retained. The practice of changing and ignoring old names is strongly to be deprecated. It is unjust to the memories of early explorers, it destroys valuable historical landmarks, and it causes much confusion.

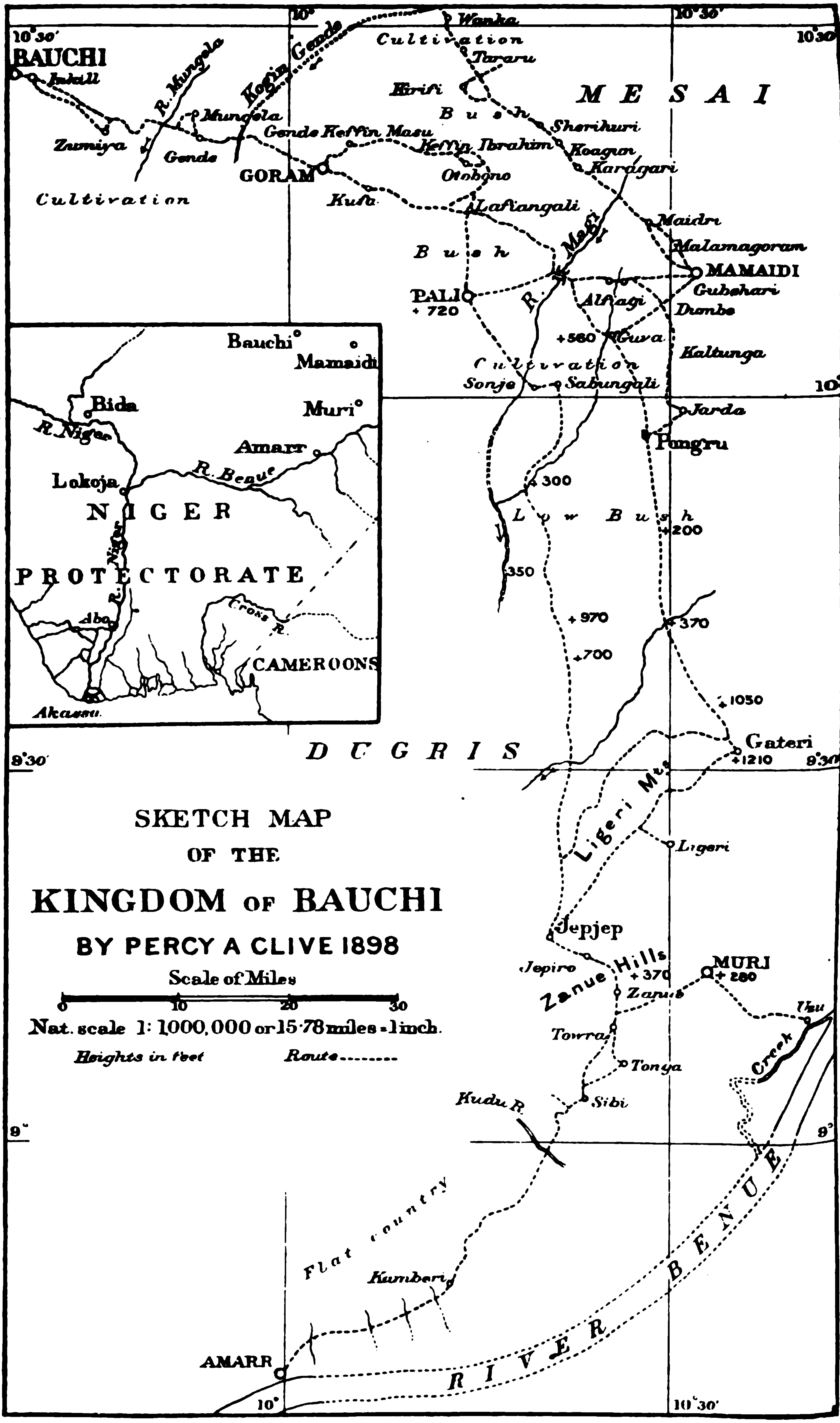
The names of Swedish foreland, King Charles island, and Abel island should be retained, but the group ought certainly to be called Wiche's islands.

NOTES ON A JOURNEY TO PALI AND MAMAIDI, IN THE KINGDOM OF BAUCHI.

By PERCY A. CLIVE.

On July 11, 1898, I arrived at Ibi, the headquarters of the Royal Niger Company on the river Benue. I had travelled up from Lokoja, where that river joins the Niger, in canoes, occupying seventeen monotonous but not unpleasant days on the journey of some 230 miles. Travelling at this time of year, when the river was low, I should describe the scenery as tame and uninteresting in the extreme. After losing sight of the hills near Lokoja, there was really nothing to break the wearisome flatness of the view all the way to Ibi. Major Mockler-Ferryman, however, in his account of Dr. Baikie's journey,* states that "the scenery of the Benue was found to be far grander than that of the Lower Niger, ranges of mountains taking the place of the swampy flats of the delta"! He quotes Dr. Baikie also as saying that "the

* 'British West Africa,' p. 73.


SKETCH MAP
OF THE
KINGDOM OF BAUCHI
BY PERCY A CLIVE 1898
Scale of Miles
0 10 20 30
Nat. scale 1: 1,000,000 or 15·78 miles = 1 inch.
Heights in feet
Route
BAUCHI
Inkill
Zumiya
R. Mungola
Mungola
Gende
Kogin Gende
Gende Keffin Masu
GORAM
Cultivation
Kusa
Wanka
Tararu
Kirifi
Bush
Sherihuri
Keffin Ibrahim
Koagum
Karagari
Otobono
Lafiangali
MESAI
Maidri
Malamagoram
MAMAIDI
Gubehari
Dombe
PALI
+720
R. Mesi
Alfagi
+560
Guva
Kaltunga
Sonje
Sabungali
Jarda
Pungru
+300
Low Bush
+200
350
+970
+700
+370
+1050
Gateri
+1210
DUGRIS
Ligeri
Jepjep
Jepiro
Zanue Hills
+370
MURI
+280
Zanue
Towra
Tonya
Sibi
Kudu R.
Ibu
Creek
Flat country
Kumberi
AMARR
RIVER BENUE
10°
10°30'
9°30'
9°
Bauchi
Mamaidi
Bida
Muri
R. Niger
Amarr
Lokoja
R. Benue
NIGER
PROTECTORATE
Abo
Cross R.
CAMEROONS
Akassu

frequent recurrence of hill and dale pleased and gratified the eye." This remarkable difference of opinion on a question of fact may be partly accounted for by the different appearance of the banks at high and low river. At the time of my journey the river was about 20 feet below the top of its banks, making it impossible to see very far inland. The "ranges of mountains," however, must be at some distance from the river to have so successfully concealed their existence. Long straight reaches are the chief characteristic of the Benue; at several points the river, both up and down stream, disappeared into the horizon without a bend in sight. The bush on both banks was always too thick to make landing possible, except where there was a village; the sandbanks were, therefore, the only available camping-ground.

The canoemen who undertake such long river journeys as this are nearly always Ganegas or riverside Nupes, and wonderful fellows they are. At break of day they roll up their "mimi" mats,* under which they sleep, eat up the remains of their last night's meal, and are ready to start off, and keep going for the whole twelve hours of daylight; this, too, with very little urging on the part of their employer. It seems to be their natural habit, and they eat as they go along, waiting till after sunset for the one big meal of the day. At times, too, where the stream runs strong, very hard work is necessary in order to get by at all; but their back and arm muscles are magnificently developed, and seem to be absolutely untiring.

At Ibi, with the help of the obliging officials of the Niger Company, I supplied myself with carriers and trade goods, and continued my journey for another 70 miles to Amarr by steamer, the scenery being as flat and uninteresting as before.

My party consisted of myself and two black servants, two horses with their attendant horseboys, 40 soldiers, and 36 carriers,† one of whom was also interpreter.

From Amarr, for three days' march the country is flat and in places swampy, though the path itself is generally hard and sound going. I left Amarr on July 18, and on my return, about five weeks later, the country for a long distance was under water, involving some danger of losing the path and getting into a swamp. The safest way was to leave it to the pony, who generally managed to keep on the hard ground.

* Mimi mats consist of two stiff sides about 6 feet square, which support one another in the form of a shelter

† Divided as follows:—

Soldiers' cooking-pots, etc.	8 loads.
Cloth and barter goods (value £50)	9 "
Three months' provisions for self	10 "
Tent and personal kit	8 "
Surveying-instruments	1 "
	36 "

The Kudu river was 20 yards broad and just fordable on my way up; on the return journey, however, it had increased to 80 yards, and when we attempted to cross on native rafts, one poor man who was swimming got pulled down by a crocodile, so we had to give up the attempt and make a long *détour* by Muri. One or two Berthon boats would have been invaluable on this occasion.

On the third day numerous villages and small towns were passed, each surrounded by an ample stretch of cultivated land. They were none of them walled, the people apparently being unmindful of the possibility of hostile raids. That such are not unknown was evident from the ruins of the old town of Sibi; the town has, however, been rebuilt on a new site, and seems as prosperous and as unprotected as ever. Towra is 90 feet above Amarr,* and from here a succession of hills are seen in front and to the right, with a group of larger peaks away to the north-east.

On the fourth day the scenery changes considerably. The Zanue hills are crossed by a pass 370 feet high, the hills on either side being perhaps double that height. More hills are seen in front and to the right after crossing the pass. The road, however, bears to the left along a flat country to Jebjeb. This town is beautifully situated on a low hill rising out of the plain, with distant hills visible on all sides. It contains about a thousand inhabitants, though there is room within the walls for double that number, and is very much subject to the king of Pali. That monarch was there at the time of my visit with some two hundred followers, who had evidently been enjoying free board and lodging for some time, as they had eaten up nearly all the food in the place. They had reserved, however, a considerable herd of cattle, which, with some ponies and donkeys, they told me were for the king of Bauchi, a still higher suzerain lord, as part of their annual tribute. The king of Bauchi, in his turn, owes allegiance to the Sultan of Sokoto.

My first sight of the king of Pali was most imposing. Having heard of the approach of my party, he came out to meet us. We had stopped the night before at the small village of Jepiroh, beautifully situated on high ground, and chiefly remarkable for the numbers of small green and red parrots that swarmed in the guinea-corn fields all round it. It was the only place where I saw them in any quantities. We started off about 6.30, while the heavy dew was still sparkling on the grass, and soon met the head of the Pali contingent. First came 150 bowmen carrying nothing but their weapons, and wearing only the smallest of loin-cloths. At regular intervals among them were mounted officers. Next came a bodyguard of twenty picked men dressed in red gowns with white pleats down the back, and armed with every imaginable kind of gun, the locks of which were encased in red leather. After passing these men I came on a really beautiful sight. The king

* All the heights on the map are taken above the level of the river-bank at Amarr.

had drawn up under the trees on one side of the path, and some forty or fifty mounted followers had arranged themselves all round and behind him. They were dressed for the most part in white gowns, but generally with either a coloured lining or another coloured gown underneath. Voluminous white or blue turbans covered their heads, and some of them wore very handsome riding-boots, though the majority were barefooted. The high-peaked saddles were covered with brightly coloured saddle-cloths, and the horses' heads were almost hidden by enormous bridles, covered with tin ornaments, which kept up a perpetual jingling as they tossed their heads about to keep off the flies. On my approach, they waved their spears over their heads with the butt to the front in token of friendship. This, with the king in the centre wearing a cap of chain mail under his turban, and bowing with courtierly grace, made a truly mediæval picture.

I travelled for four days in company with these people to the town of Pali. The first three days were all through the orchard-like bush of stunted trees which is the prevailing vegetation throughout this country, and effectually prevents one seeing more than 100 yards in any direction. Occasionally we caught a glimpse of the same distant peaks that I had seen from Towra, and on the first day we passed by the western ends of the Ligeri and Goura ranges. But after that there were no well-marked features, the country being gently undulating. In fact, we seemed to be crossing diagonally one immense undulation, which rose gradually to a height of 1200 feet, and then sloped down again. At varying distances on our left and running parallel with our path was a river, which, however, I never succeeded in seeing on account of the dense bush near its banks. I once saw the tracks of hippopotami near it, so it must be fairly large.

At Sabungali we entered what proved to be a fertile and highly cultivated district. Between here and Pali the path wound among waving crops of guinea-corn and "giro" (millet). These are planted in alternate rows, the giro being harvested in August, but the guinea-corn not till December, by which time it is 16 to 18 feet high—a magnificent sight, with its delicate green leaves and feathery heads of red, white, and yellow grain.

The walls of Pali enclose a considerable area, not all of which, however, is built over, a wide strip just inside the walls being under cultivation. This arrangement for a permanent food-supply within the walls is a precaution in view of the prolonged sieges which are the usual form of war in this country. There are some more solidly built houses here than I saw anywhere else, though no better material than mud is used. The king's compound is half a mile round, and enclosed by a 12-foot wall with only one entrance through it.

Mamaidi is a more compact town, surrounded by a wall and two ditches. It has a fair-sized market-place and one good street. As in

all Fulani towns, each family has its own compound, surrounded by mat walls, and entered through a zowreh, or entrance-porch. There are four or five round houses inside, of the usual type, and all the space in between them is cultivated. Water is drawn up by hand from wells of considerable depth. The country all round Mamaidi is cultivated for at least 3 miles from the town. Here I met Lieuts. Bryan and Macnaghten on their return from Bauchi. To the latter I am indebted for all that part of the map to the north of Pali and Mamaidi. They were very much disappointed with the town of Bauchi, and declared that there was not room within the walls for the 150,000 which Rohlfs reckoned as the population. They put it down as from 15,000 to 20,000. They had the greatest difficulty in getting back across the Kogin Gende river, as there were no canoes to be had, the native method of crossing being to swim across with their loads on their heads, and a large calabash underneath them for extra buoyancy.

We returned to Jebjeb *viâ* Gateri, a town peopled by Jukus, a peaceful tribe whose chief occupation is fishing; for this purpose they spread all down the Benué during the dry season, living in temporary huts on the sandbanks. The town is beautifully situated high up on the southern slope of a hill.

Their neighbours, the Ligeris, are a very warlike pagan tribe, who earn a precarious living by raiding caravans. Our party, however, was too strong to tempt them. A stream just beyond Jebjeb, which I had not noticed on the way up, was sufficiently flooded to cause us a day's delay, and the Kudu river being, as I have said above, impassable, we were compelled to go round by Muri, and strike a creek of the Benué at Uzu. The view from Muri is well described by Bishop Crowther in his 'Journal.' * The appearance of the mountain ranges on the other side of the Benué is particularly striking; they probably stand over 2000 feet above the plain.

Muri is still a thriving town, with its herds of cattle and extensive rice-fields, but its political importance is gone since the Emir migrated across the Benué and founded a new capital at Jalingo. That, at least, is the name of the town as given to us, but it is very likely that it is the same place as Bakundi, for no two black men pronounce the name of their native town alike. We had the greatest difficulty more than once in getting hold of the right names of places.

From the foot of the hill on which Muri is built, the country was under water nearly the whole way to Uzu, and on either side of the road appears to be a mere swamp. The creek or backwater on which the village of Uzu stands is too small for steamers. It took us a whole day punting and one night drifting down it before we reached the main stream; so probably the shortest way into the river is by going up-

* 'Journal,' 1855.

stream. We reached Amarr on September 5, and found various exciting events in progress, but of more military than geographical interest.

On the 8th I arrived once more at Ibi and comparative civilization, having dropped down stream in a native canoe in eighteen hours from Amarr.

I saw no large game of any sort in the course of my journey, but that was only to be expected in the rainy season when the grass is long. Twice, however, we saw elephant tracks across the path; and at Jebjeb I followed up some giraffe tracks for several hours, without, however, seeming to get any nearer to the animal.

Taking observations was also most uncertain work, as the sky was always cloudy. In fact, I only succeeded in taking six reliable observations the whole time. But the beginning of the rainy season is not a bad time for travelling, as the sun's rays are generally tempered by welcome clouds, and also there is enough water in the small streams to save any anxiety on that score.

PROFESSOR DAVIS ON PHYSICAL GEOGRAPHY.

By HUGH ROBERT MILL, D.Sc.

PROF. W. M. Davis, who occupies the Chair of Physical Geography in Harvard University, has published, with the assistance of Mr. W. H. Snyder, a little book to which the title of 'Physical Geography' * is peculiarly applicable. The book is strictly geographical, and purely educational. It avoids the wider scope of physiography, and deals only with facts the relations of which are sufficiently well known to admit of a clear statement of cause and effect. The theories which are dealt with are carried no farther than the supporting facts warrant, and, while the style could not be clearer or the language more precise, there is a complete absence of technical terminology, which might deter the general reader or make the book unattractive for use in schools. The leading principle of the book is thus expressed in the preface:

"The Earth's physical features must not only be described—they must be explained, so that the understanding shall aid the memory in holding them in mind. They must not be presented apart from the manner in which they affect man's ways of living; attention must frequently be drawn to the association of human conditions with the environment by which they have been determined, in order to form the habit of looking at the features of the Earth as prime factors in guiding

* 'Physical Geography.' By William Morris Davis, Professor of Physical Geography in Harvard University, assisted by William Henry Snyder, Master in Science in Worcester Academy. Boston, U.S.A., and London: Ginn & Co. 1898.

the development of mankind. In brief, physiographic facts should be traced back to their causes and forward to their consequences; and thus the phrase, 'causes and consequences,' comes to serve as a touchstone by which the treatment of the subject may be tested."

This scientific conception of geography animates the whole book. The introductory chapter very briefly points out that man is very largely a creature of his natural surroundings, and the following chapters are devoted to the study of those surroundings in gradually increasing detail. Chapter II., "The Earth as a Globe," is a very slight sketch of mathematical geography, and is reinforced by several appendices touching on various points in geodesy, the determination of latitude and longitude, and the theory of maps. Chapter III. deals with the Atmosphere, especially in regard to normal climate and weather-changes. Chapter IV. discusses the Oceans. Waves and tides are treated with proportionately great detail and success; the other parts of the subject are not quite so satisfactory. The definition of an "ooze" as a deep-sea deposit of animal origin is a slip for "of organic origin;" but even such trifling errata are exceptionally rare.

Chapter V., "The Lands," is reached on the ninety-first page. It touches on various general points as to the arrangement and structure of land and the distribution of life. The following five chapters are the most original and the best, dealing respectively with Plains and Plateaus, Mountains, Volcanoes, Rivers and Valleys, and the Waste of the Land. Land-forms are dealt with in a comprehensive and yet definite manner, the fundamental classification being by their origin. The many varieties of the coastal plain have never previously been so clearly described or so simply explained, the origin of the form leading directly to the consequences of the form with regard to the distribution of plant, animal, and human life. The same method is carried out for other land-forms, and the descriptions are greatly aided by admirable diagrams in the form of drawings of models combining the superficial appearance and the geological structure of the various features. In dealing with the waste of the land, Prof. Davis calls attention to a matter which has hitherto been unduly neglected in geographical books. Geologists frequently treat of the waste of the land in order to emphasize the different effects produced by weathering on rocks of different composition, texture, and structure. Here we find the geographical aspect of the subject in the study of the phenomena common to the weathering of all rocks:—

"There are many resemblances between the movement of water-streams and of waste-streams. Water flows along stream and river channels more rapidly at the surface, more slowly at the bottom; it is here delayed in lakes, there hurried down rapids. Land-waste may be thought of as moving in streams and sheets down every hillside and along every valley, more rapidly at the surface of the ground, more

slowly at a depth of several feet; more rapidly on steeper slopes, more slowly on plains. The shape of the land-surface and its usefulness as a home for man depend in no small degree on the character of the sheet of waste with which it is clothed."

Chapter XI. is on Climatic Control of Land-forms, a somewhat ambiguously worded title, as the chapter has to be read before one understands that it means the changes produced in land-forms by climate, not the changes produced in climate by land-forms. The effects of floods, of wind, and ice-action are considered under this head.

The twelfth and last chapter is devoted to shore-lines, the elaboration of part of the earlier discussion of coastal plains, and it is very well done, including a discussion of the growth of coral reefs with an absolute minimum of theory.

We know of no other American text-book which draws so freely on other continents for illustrations of striking scenery, although not neglecting the splendid type-specimens of almost every land-form which the surface of the United States supplies. The illustrations are very numerous, most of them new, and all good; but the maps supplied at the end are not sufficient to render an atlas indispensable. Taken altogether, text, illustrations, and maps make up a work of unique value which ought to produce a great effect on the geographical education of the English-speaking peoples.

PROF. PETTERSSON ON METHODS OF OCEANOGRAPHIC RESEARCH.

By H. N. DICKSON.

The number of investigators taking an interest in oceanic physics is slowly but steadily increasing, and every addition to the number makes it more and more desirable that a uniform method of observation should be adopted, in order that the work of each observer should be strictly comparable with that of all the others. In oceanography, as in meteorology, a system of observation has been elaborated such that, while most of the individual methods are susceptible of high refinement in special cases, the ordinary observer need find no difficulty in attaining sufficient accuracy for practical purposes, the all-important matter being to ensure comparability. A certain margin of probable error may sometimes be admitted, which, although not showing a method at its best, means an immense saving of time and labour in dealing with large quantities of material, and makes no appreciable change in the geographical significance of the results.

The system now recommended for general adoption has been elaborated by Prof. Otto Pettersson and his colleagues, and subjected to severe practical testing in the international and other investigations carried on during the last six years in the North sea and North Atlantic. An authoritative explanation of it was published by Pettersson in the *Annalen der Hydrographie* for August last, and the gist of that article is here produced. Those parts of it which have already been

fully explained in English in the series of papers on the same subject in the *Scottish Geographical Magazine* for 1894, or which deal with purely technical details of laboratory manipulation, are condensed or omitted.

It is pointed out that, for a complete knowledge of the circulation of water in any region, observations must not, as has been usual, be restricted to the summer months: the changes taking place in the surface layers of water at different seasons are of the greatest importance in relation to climate and the migration of fishes. For this purpose depths of less than 300 to 450 fathoms (600 to 800 metres) are to be regarded as superficial; beyond that limit seasonal variations cease to be perceptible, and the principal phenomena of currents, etc., are to be found between these depths and the surface.

The method of investigating these superficial layers which has been found most successful, is to have observations made at as nearly as possible the same instant, at a series of points or stations, and along a network of lines distributed over the whole area under investigation. These observations are repeated at as frequent intervals as possible—every three, six, nine, or twelve months—so as to afford data for a series of synoptic charts representing the changes over the whole area. To carry out this plan with any degree of completeness over a large area, such as the Baltic, North Sea, and North Atlantic, it is obvious that some system of international co-operation is essential. Each stage of the work done in the past has led farther and farther seaward, the investigations in the Baltic could not be completed without observations in the North sea, those in the North sea were incomplete without observations in the Atlantic, and so on; but, except during the joint expeditions of 1893 and 1894, which were merely of the nature of a reconnaissance, it has never been possible to get observations on a uniform method over the whole region at the same time. Nevertheless, it is already demonstrated that the beginning of some of the great fishery seasons, such as the times for herring and mackerel fishing, coincides with remarkable changes in the physical and chemical conditions of the surface waters, and in the distribution of plankton. A rational organized regulation of the fishing industries must ultimately be based on a deeper insight into the relations existing between these phenomena, obtained by joint investigation, each country surveying its own fishing-grounds and the seas surrounding them. Isolated expeditions for the study of special biological problems, and, except in a few special cases, observations made at coast stations, can be of little practical value unless combined with a general survey of the nature described.

The observations required fall under three headings—

(*a*) Deep-sea observations.

(*b*) Temperature observations and collection of samples of surface water and plankton by steamers crossing the North sea and North Atlantic.

(*c*) Observations in coastal waters.

Experience has shown that observations of classes (*b*) and (*c*) can be obtained without much trouble or expense; ship-masters are, in fact, always anxious to give assistance when a scheme likely to lead to results of practical value is put before them. The expensive information is that of the (*a*) class, and it is therefore desirable to reduce the number of expeditions and stations to a minimum. Certain positions have already been recognized as of special significance in affording a general view of the area within which they are situated, and it is likely that, with the growth of knowledge, the number required to determine the conditions at a given time would become comparatively small.

Great economy of time and money may be effected by restricting the work at sea on such expeditions absolutely to the collection and preservation of material.

This has been constantly kept in view during recent years, and the chemical and biological examination of the samples obtained is now wholly carried out in laboratories on shore after the sea-work is finished. It is thus possible to do the work at sea efficiently with a much smaller staff, and without specially fitted laboratories and apparatus on board each vessel; and the chemical work, at least, gains immensely in accuracy. It is only on long expeditions that a special laboratory on board is necessary, and then only for work in harbour.

It is not to be expected, nor is it desirable, that the workers on all deep-sea expeditions should employ absolutely the same instruments in precisely the same way. There is, indeed, no standard set of instruments obviously to be recommended in preference to any other; but a few general principles may be laid down as the result of the joint experience of observers.

A water-bottle with non-conducting water-jackets should be used for all moderate depths. This instrument should be made so as to have the least possible heat capacity, the metal employed should be a good conductor, and it should have perfectly free circulation of water through all its parts when open: under these conditions it takes the exact temperature of the surrounding water very quickly while descending. The water-bottle must close perfectly tight, so as to retain the sample of water in the central tube unchanged, and prevent large temperature-variations in the outer non-conducting jackets. When these conditions are fulfilled —as they are in the special form of instrument devised by Prof. Pettersson—the sample is much better isolated than in any water-bottle with a non-conducting jacket of gutta-percha or similar material, and a more accurate and reliable temperature observation can be made after the instrument is got on board than is possible with reversing thermometers taking the temperature *in situ*. The chief disadvantage, as compared with the reversing thermometer, is, of course, the difficulty of taking a series of temperatures at different depths with a single sounding, but this becomes important only when the depths are considerable, and it is then safer to have the reversing thermometer for comparison in any case.

In collecting samples for gas analysis, it is important to use the non-conducting water-bottle, whatever the depth, as the dissolved-gas contents of the sample may be considerably affected if exposed to large changes of temperature.

For all deep-sea purposes, it is best to use a flexible wire sounding-line of steel or phosphor-bronze. Prof. Pettersson prefers a rope of 49 phosphor-bronze wires 0·3 mm. in diameter, obtained from the Fonderie Anderlech, in Brussels. Great purity of material is important here, as a very small quantity of foreign metal (*e.g.* bismuth) seriously reduces the breaking strain of the rope. In working at great depths, it is best to have a line consisting of several parts of different thicknesses, so that the breaking strain increases proportionally with the weight of line. The hauling up can be done by steam; the speed of winding may average about 40 fathoms per minute, but should never exceed 55 fathoms per minute.

The ideal metal for deep-sea instruments is German silver; nickelled surfaces are to be avoided. Brass is a quite satisfactory material, and has the merit of cheapness, but the instruments must always be washed in fresh water and dried and polished after use. Galvanized iron may be used for rough instruments without sliding parts.

The first essential in studying the features of the circulation of water in any region is to ascertain the sources whence the water-supply has been derived; thus in all latitudes in the Atlantic, waters from north and south are to be found close together, arranged in layers or in various stages of mixture, and the different elements can only be identified by minute physical, chemical, and biological examination, the important factors being temperature, salinity, gas contents, and

the general character of the animal and vegetable plankton. In the case in question, one has to deal with "Gulf Stream" water, Arctic and West Atlantic water, and all attempts to identify these separately by variations in relative proportions of the dissolved salts having proved vain, the general distribution of the elements just named is the only available means of investigation. The first place in importance must be given to the distribution of salinity, and it is absolutely necessary to employ a physical or chemical method by which this can be determined with a high degree of accuracy, in large numbers of samples, with a reasonable expenditure of time and labour. There can now be little doubt that by far the most satisfactory method in every respect is that first employed and advocated by the Swedish investigators, and now generally adopted by almost every one who has to deal with large quantities of material—the determination of the total halogen by estimation as salt of silver, either gravimetrically, or volumetrically by titration with a one-fifth normal solution of silver nitrate. The method of titration admits of sufficient accuracy to allow of the determination of salinity to within 0·1 *pro mille*, using only 10 cubic centimetres of each sample. Prof. Pettersson gives very full details as to the mode of working, precautions to be observed, etc., which are indispensable to the practical analyst, but are too long and too severely chemical to be given here.

Another method of ascertaining salinity is to determine the specific gravity of the water at a standard temperature with a Sprengel pyknometer. Hydrometers of all sorts are to be avoided, on account of the great difficulty of getting and maintaining the uniform standard temperature in the whole mass of the water, the hydrometer, and all its surroundings. Unless this condition is fulfilled, hydrometer determinations, though apparently very consistent amongst themselves, may be exceedingly inaccurate.*

Where analytical work is done on an extended scale, it is desirable to have a set of standard samples of sea-water of which the specific gravity, chlorines, sulphates, and "total solids" have been carefully determined, to be used as "controls" in making up fresh solutions of reagents, etc.

The alkalinity of sea-water offers a considerable field for investigation, since it is now known that the alkalinity of samples stored in glass bottles alters considerably, and most of the determinations made up to the present have been affected with error on this account. Titrimetric determinations of the alkalinity of sea-waters collected in *earthenware* bottles are probably free from objection, and an extended series of such observations is likely to be of great value.

The real significance of determinations of the quantities of gases dissolved or absorbed in sea-water has only been fully recognized in quite recent years, and the extreme interest and importance of this branch of oceanographic research demand the translation of Prof. Pettersson's remarks upon it at length. The amount of dissolved nitrogen in a deep-water sample enables us, by calculating the "saturation temperature" by the graphic method of Hamburg, to ascertain the temperature which the water possessed on the last occasion when it was at the surface, and so, in many cases, to discover *where* it was last at the surface. The amounts of dissolved oxygen and carbonic acid throw much light on the biological conditions. In 1890, Pettersson and Ekman found that the water in an isolated part of a Swedish fjord contained a great excess of carbonic acid and a corresponding deficiency of oxygen, and subsequent experiments in an aquarium confirmed their supposition that these

* The writer has found that, using ordinary precautions only, salinity determinations by chlorine titration and the pyknometer agree, in general, to within less than 0·2 *pro mille*, and in cases where larger error has occurred, the fault has been found to be almost invariably on the side of the pyknometer.—H.N.D.

abnormalities were due to the respiration of marine animals. Later observations showed that similar peculiarities occurred in intermediate water-layers not completely cut off from the open sea as in the first case. Thus, in the Gullmar fjord, where in the winter 1895–96 successful herring fishery was carried on, it was found that in a layer between 20 and 30 fathoms below the surface the amount of carbonic acid was 48·5 to 49·6 cubic centimetres per litre, and of oxygen only 5·6 to 3·9 cubic centimetres, as compared with 47·4 and 7·1 cubic centimetres respectively outside the mouth of the fjord, the temperatures being identical. Employing deep-water nets, it was found that during the day the herring could be caught only in the 20 to 30 fathom layer inside the fjord; at night they came to the surface waters (containing 7·1 cubic centimetres of oxygen per litre), and could be taken with ordinary nets.

Prof. Pettersson fairly concludes from this that the deficiency of oxygen in the bottom waters in certain parts of the North sea, observed by the expeditions of the *Pommerania* and *Drache*, and by himself in the Skagerak and Baltic, may be regarded as a result of the presence of animal life. The deeper waters of the North sea and the Baltic are in general poor in oxygen—a fact which corresponds well with the great richness of the North sea fisheries.

An exactly opposite effect has been observed in oceanic water where the influence of plant-life is predominant; the algæ, diatoms, cilioflagellates, etc., reduce the percentage of carbonic acid and increase that of oxygen. A number of samples of deep water obtained by the *Challenger* and Norwegian North Atlantic Expeditions, mostly from high latitudes, were found to be supersaturated with oxygen. Pettersson found similar conditions in the Baltic east of Gothland, where Hensen has shown that the surface waters are very rich in diatoms; and again in the Skagerak, in water which from its temperature and salinity had been supposed to come from the Western Atlantic. Dr. M. Knudsen, chemist of the Danish *Ingolf* Expedition, has found that excess of dissolved oxygen, due to the action of plant-life, may be present even at the surface, and Pettersson has recently shown that this occurs in the surface waters of the Skagerak.

Samples of sea-water for gas analysis must be preserved in exhausted tubes. which are filled direct from the water-bottle as soon as it comes on board, and sealed off. In view of the action of organisms just described, it is advisable to coat the inside of these tubes with a thin layer of perchloride of mercury before drying and exhausting them, by washing them out with a dilute solution. Two tubes of each sample are required, as it is impossible to make the carbonic acid and oxygen determinations from the same tube. The volume of the tubes should be about 150 cubic centimetres.

The description and quantitative estimation of the organisms in sea-water have been brought prominently forward in oceanographic research during recent years. The qualitative or descriptive side has been largely developed by the Swedish biologists Cleve and Aurivillius, who have classified the forms constituting the plankton in different regions into types, investigated the geographical distribution of these types, and found that a close relation exists between the physical and chemical conditions of surface water and the plankton, especially the phytoplankton, which it contains. The different physico-chemical regions into which the North Atlantic has been divided, for example, have each characteristic plankton types, and the appearance of these types in different parts of the North sea and Skagerak at different seasons of the year coincides with the influx of waters from those regions. The most recent result is that at certain seasons large areas of the North Atlantic are practically devoid of plankton, while an aggregation, or special abundance, occurs in other parts at the same time. Our knowledge of this subject is as yet only in its infancy, but the advantages to be derived from extended

co-operative research are already obvious. The Swedish Hydrographic Commission has arranged for a series of plankton observations being made on board a number of Trans-Atlantic and North sea steamers, and regular collections are being made at the Bermudas, Azores, Færoes, and Shetlands, and in Iceland. The director of the Danish Hydrographic Office has arranged for daily observations on the steamers plying to Iceland and Greenland, and regular work is being done at the stations on the Norwegian coast, at the marine biological stations at Plymouth, St. Vaast la Hougue, and Helder. This preliminary survey will suggest the lines to be followed in organizing a more complete investigation.

The plankton of intermediate and deep layers can be examined by using a horizontal tow-net which can be opened and closed. The form used by Prof. Pettersson is fully described in the *Scottish Geographical Magazine* for 1894, p. 299.

Quantitative estimations of the plankton, such as those made extensively by Hensen, and of the numbers of pelagic eggs and fish-larvæ, like those of the German Commission, the Fishery Board for Scotland, and the Danish biological stations, are of course of the greatest importance in the discussion of fishery questions, and there is the further need of more extended knowledge of the life-history and development of the organisms whose distribution is examined. Problems of the last-named order must be investigated by the marine biological stations now dotted round the coasts of the North sea and the Baltic. Prof. Pettersson points out, however, that most of the existing stations are situated at points remote from deep water, so that they offer no opportunity of studying deep-living organisms in their natural habitat, and our knowledge of the conditions of pressure, salinity, and temperature in the depths is as yet insufficient to enable us to reproduce these conditions in aquaria, at least in a manner quite satisfactory to the organisms. Prof. Pettersson has suggested to the Royal Academy of Agriculture at Stockholm the desirability of establishing a station at a point off the western coast of Sweden, where a depth of 30 fathoms can be obtained close in shore; water from the depth could be pumped directly into the tanks, or cages containing specimens under investigation could be anchored at any desired level. It is increasingly evident that the hydrographic conditions have been far too little considered in the past in this connection, and it must be remembered that a situation exposed to winds and waves does not necessarily offer truly marine conditions.

Reference is made to the method of studying the circulation of surface waters by means of floats or drift-bottles, which has been largely employed by the Prince of Monaco, the Deutsche Seewarte, Dr. Fulton of the Scottish Fishery Board, Mr. W. Garstang, and others, and has shown that in careful hands it may yield results of considerable value. Dr. Schott has recently proved that the construction of the float used has wonderfully little effect on the course it takes, and it follows that the simplest form is the best; the Swedish investigators use a glass bottle of about 100 cubic centimetres capacity, loaded with sand, and containing a stamped post-card with suitable legend.

THE NATIONAL ANTARCTIC EXPEDITION.

Deputation to the Government.

On June 22 a large and influential deputation waited upon the Right Hon. A. J. Balfour, First Lord of the Treasury, with a view to urge the claims of the National Antarctic Expedition upon Government

support. Among those forming the deputation were the following: The Duke of Northumberland, the Earl of Rosse, Lord Kelvin, Sir George Gabriel Stokes, Sir Clements R. Markham, Sir Joseph Hooker, Admiral Sir Leopold McClintock, Admiral Sir Erasmus Ommaney, Admiral Sir Vesey Hamilton, Admiral Sir Anthony Hoskins, Admiral Markham, Sir Michael Foster, Prof. Rücker, Sir Henry Norman, Sir John Kirk, Sir Charles Wilson, Sir William Crookes, Sir George Goldie, Sir William White, Sir Clement Hill, Sir John Evans, Colonel Sir T. H. Holdich, Sir George Robertson, Prof. Storey Maskelyne, Dr. F. Du Cane Godman, Prof. Judd, Prof. G. Darwin, Sir Martin Conway, Mr. A. B. Kempe, Prof. Frankland, Dr. T. W. Blanford, Dr. Alexander Buchan, Prof. Ewing, Dr. Günther, Colonel Le Messurier, Dr. P. L. Sclater, Prof. T. G. Bonney, Prof. Oliver Lodge, Prof. E. Ray Lankester, Mr. F. C. Selous, Mr. W. Whitaker, Captain A. Mostyn Field, R.N., Mr. E. L. S. Cocks, Mr. J. F. Hughes, Mr. Howard Saunders, Colonel Church.

The deputation was received in response to the following influentially signed letter to Lord Salisbury and the Hon. Arthur J. Balfour:—

"*To* Her Majesty's Prime Minister and the First Lord of Her Majesty's Treasury.

My Lords,—When an appeal was made to the Prime Minister in 1897, with the object of obtaining the despatch of a Scientific Antarctic Expedition, the ground of refusal was that, under existing circumstances, and in view of Australia's reluctance to co-operate at that time, Her Majesty's Government could not embark upon an undertaking of such magnitude.

We now make an urgent appeal to Her Majesty's Government to propose to the House of Commons a grant in aid, to enable an expedition on a modest scale to be despatched with the object of securing some of the results of antarctic exploration.

The great importance of despatching an expedition, from the point of view of the progress of science, induced us to appeal to the country for funds, and our appeal has met with a most generous and patriotic response. We now, therefore, approach Her Majesty's Government with a definite scheme, and, in place of help hitherto refused by the Australian Governments, we offer a sum of £40,000 already subscribed in this country, which is sufficient to pay a considerable portion of the cost of an expedition. We only ask that this sum may be adequately increased by a Government grant.

This is the first time that the Royal Society and the Royal Geographical Society, aided by other scientific bodies, have combined to organize and despatch an expedition. Such an undertaking is outside their ordinary duties, and they entered upon it with a serious sense of the responsibilities it will entail, but with a strong feeling that, under the circumstances, no other alternative was left to them. This, therefore, is in no sense a private enterprise, while its objects are precisely identical with those of the many polar expeditions despatched or subsidized by the Government, as shown in the annexed list. Its national and representative character is emphasized by His Royal Highness the Prince of Wales having consented to be Patron, and His Royal Highness the Duke of York to be Vice-Patron, of the expedition.

An appeal which has been received from the scientific bodies of Germany to

co-operate with a German expedition (for the equipment of which the Reichstag has been asked to vote £50,000, supplementing a large public subscription), renders it still more incumbent upon us to commence our preparations without delay. There can be no doubt that, considering the modest scale of both expeditions, such co-operation would be most desirable. In more than one branch of scientific investigation simultaneous observations at distant points near the same parallels, if not essential, will largely increase the value of the results. It is obvious that in many ways the co-operation of the English and German ships will have a tendency to reduce the cost.

On the grounds of policy alone, we submit that this is not a time for our country, so long the mother of discovery and of maritime enterprise, to abdicate her leading position. From the results of our exploring expeditions in times past, not only the naval service and the country, but the whole civilized world have derived benefit. It is certainly the desire of the people of this country that her glorious traditions should be maintained.

The expedition will probably last from two to three years, and among its principal objects will be geographical exploration of the unknown region, the taking magnetic, meteorological, and biological observations, and deep-sea sounding and dredging.

We do not, however, propose to enter upon a detailed statement of the scientific results in this letter, since we enclose, for the information of your Lordships, a memorandum containing an explanation of the objects of the expedition. But we may observe that the most important work, and the work which will be of the greatest practical utility, is that connected with terrestrial magnetism, and that the requirements of magnetic observations necessitate the building of a specially constructed vessel.

The cost of an Antarctic Expedition cannot be exactly estimated until tenders have been received for building the ship based on drawings and specifications, nor until it is known how long the expedition can be employed. This must depend on the funds. But allowing for three years, the estimate for an expedition such as it would be desirable to equip, would amount approximately to £100,000.

	£
Building a suitable vessel	35,000
Fittings, etc.	4,000
Salaries and wages, three years	20,000
Provisions	8,000
Clothing, outfits	7,000
Coals and stores	10,000
Landing party	6,000
Contingencies	10,000
	£100,000

The Lords Commissioners of the Admiralty have undertaken to furnish the scientific instruments.

We thus submit, for the consideration of Her Majesty's Government, our scheme and our estimate, and we enclose a statement of the valuable results which we hope to secure. It is a national enterprise, supported on good grounds by all the scientific bodies of the Empire, and we request the Government to supplement our fund of £40,000 by proposing a Parliamentary grant sufficient to complete the estimate for the equipment of a properly found Antarctic Expedition. The payments under such a grant might be spread over four or even five years. There can be no doubt,

judging from former precedents, of the reception which such a proposal will receive from a British Parliament.

We request your Lordships to receive a deputation of our number to furnish any further information which may be considered desirable.

(Signed)

LISTER, *President of the Royal Society*; CLEMENTS R. MARKHAM, *President of the Royal Geographical Society*: WILLIAM CROOKES, *President of the British Association*; KELVIN, *President of the Royal Society of Edinburgh*; ARGYLL, *Past President of the Royal Society of Edinburgh*; LOTHIAN, *President of the Royal Scottish Geographical Society*; JOHN LUBBOCK, *Past President of the British Association*; JOSEPH D. HOOKER, *Past President of the Royal Society*; JOHN EVANS, *Past President of the British Association*; JOHN MURRAY, *Director of the "Challenger" Expedition Publications*; RICHARD STRACHEY, *Chairman of the Meteorological Council*; W. H. M. CHRISTIE, *Astronomer Royal*; ARCHIBALD GEIKIE, *Director-General of the Geological Survey of the United Kingdom*; G. H. DARWIN, *President of the Royal Astronomical Society*; WILLIAM H. FLOWER, *President of the Zoological Society*; A. GUNTHER, *President of the Linnean Society*; W. WHITAKER, *President of the Geological Society*; T. E. THORPE, *President of the Chemical Society*; OLIVER J. LODGE, *President of the Physical Society*; JOSEPH LARMOR, *President of the Cambridge Philosophical Society*; HORACE LAMB, *President of the Manchester Literary and Philosophical Society*; THOMAS FOWLER, *Vice-Chancellor of the University of Oxford*; ALEX. HILL, *Vice-Chancellor of the University of Cambridge*; HENRY E. ROSCOE, *Vice-Chancellor of the University of London*; N. BODINGTON, *Vice-Chancellor of the Victoria University*; A. B. KEMPE, *Treasurer of the Royal Society*; MICHAEL FOSTER, *Secretary of the Royal Society*; ARTHUR W. RUCKER, *Secretary of the Royal Society*; W. T. BLANFORD, *Treasurer of the Geological Society*; P. L. SCLATER, *Secretary of the Zoological Society*; ALEXANDER BUCHAN, *Secretary of the Scottish Meteorological Society*; L. DARWIN, *Secretary of the Royal Geographical Society*; J. F. HUGHES, *Secretary of the Royal Geographical Society*; EDWARD L. S. COCKS, *Treasurer of the Royal Geographical Society*; W. A. HERDMAN, *Professor of Natural History in the University College, Liverpool*; F. LEOPOLD MCCLINTOCK, *Admiral*; ERASMUS OMMANNEY, *Admiral*; ANTHONY H. HOSKINS, *Admiral*; R. VESEY HAMILTON, *Admiral*; G. S. NARES, *Vice-Admiral*; A. H. MARKHAM, *Vice-Admiral*; A. MOSTYN FIELD, *Captain R.N.*"

The deputation was introduced by Sir Clements Markham, K.C.B., President of the Royal Geographical Society, who spoke as follows:—

The deputation consists of two past Presidents of the Royal Society, of all the signers of the letter to the Marquis of Salisbury and yourself who have been able to come, of members of the Council of the Royal and Royal Geographical Societies, of numerous other scientific men of eminence, and of several naval officers, including five admirals of arctic experience.

It will perhaps be most convenient if I begin the interview by stating our grounds for asking for a grant to the Antarctic Expedition in general terms. It is now fifty-six years since the return of Sir James Ross from his memorable antarctic voyage. During that time the methods and appliances for scientific investigation have been

greatly improved, especially as regards apparatus for deep-sea sounding and dredging. At the same time actual exploration, difficult and perilous though it must always be, has been facilitated at least twenty-fold by the introduction of steam. It was these considerations which caused a feeling to grow up among scientific men that there ought to be a renewal of antarctic research, in order to secure the very important scientific results which it was known must accrue from such a renewal. This feeling was not confined to societies in this country but was shared by men of science throughout the civilized world. When, therefore, it was found that Her Majesty's Government would be unable to undertake an enterprise of such magnitude as would be involved in a naval expedition, and when it was ascertained that the Australasian Governments would give no help, the Royal Society and the Royal Geographical Society resolved to undertake a smaller enterprise themselves. They did this with the cordial approval of all the other scientific bodies of the empire. They felt that it was a duty, and that they were left no choice; and they expected to receive assistance from Her Majesty's Government, provided that their appeal to the country for funds was favourably received. Their application for help, now that the country has entrusted them with a sum of £40,000, is based on the following grounds.

For the last century and more the successive governments of this country have sent forth numerous polar expeditions both to the north and south, with the objects of geographical discovery and the advancement of other branches of science—in short, for the increase of the sum of human knowledge. For a century our rulers have believed that expeditions with such objects were beneficial to the country. I do not say that these were the sole objects of such statesmen as Lord Liverpool, Lord Melbourne, Sir Robert Peel, or Lord Beaconsfield, who sent the expeditions; or of the Lords of the Admiralty who were foremost in advocating polar research—men like Sir Henry Hotham, Sir George Cockburn, and Admiral Bowles, and in our own day as Sir Vesey Hamilton, Sir Anthony Hoskins, and Sir Edmund Commerell, who has spoken most strongly on the subject. They looked to the encouragement of maritime enterprise, they looked upon the polar regions as a splendid school for the exercise of the best qualities of a seaman, and considered the value of such expeditions to the navy in time of peace.

Still, the avowed object of Government expeditions was scientific research. Our objects are identical. We are undertaking work which successive generations of our statesmen and naval officers have looked upon as beneficial to the country and to the navy, and for this reason we think that we have a claim for the favourable consideration of our request for help from Her Majesty's Government.

But that is not the only ground for our expectation. Some of the scientific results which we seek to obtain are of immediate practical value. Indeed, all scientific research becomes eventually, directly or indirectly, sooner or later, practically useful. Much of the antarctic work will, however, at once be of use to navigation. This is especially the case as regards the magnetic survey, as will be more fully explained by Prof. Rücker. Meteorology is another branch of antarctic research which will be practically useful. The unknown region covers millions of square miles, but it touches or impinges upon oceanic regions to the north which are frequented by our shipping. As regards winds and currents such adjacent regions act and react upon each other, so that the removal of total ignorance, as regards one of them, must be practically useful to the navigation of the others. A knowledge of meteorology necessitates geographical discovery, because its phenomena are influenced by the distribution of land and water. Geography depends upon geology and biology, and thus one science cannot be benefited without advancing the others.

We believe that this practical utility of the scientific researches to be undertaken

in the antarctic regions is another claim for the favourable consideration of our application for help.

There have formerly been some private expeditions to the polar regions; but, when application has been made, naval officers have always been allowed to join them, and help has invariably been given, on three occasions in the form of Treasury grants. A refusal of help would be absolutely unprecedented.

But this is the first occasion in the history of our country that the Royal Society and the Royal Geographical Society have combined to equip and despatch an expedition. It is no part of their ordinary duties. It is a great responsibility, and we shall have many difficulties which would be unknown to the Admiralty—a department accustomed to the equipment of polar expeditions for the last century.

We have been invited to co-operate with the German expedition, and we cannot hold back. England has held the front rank in maritime discovery for three centuries, and her place must be maintained by her sons. We have striven to collect the necessary funds. Our fellow-countrymen have been most generous. But the sympathizer who has contributed most liberally has done so mainly to enable his country to maintain her old and glorious place in the van of discovery. The German expedition is to receive a grant of £60,000 from the German parliament. I do not mention this, sir, as a precedent—we have plenty of good precedents of our own, without the need of going abroad for them; but I mention it to show that the German vessel will be efficiently equipped.

We are bound, in the cause of science and for the honour of our country, to co-operate with the German expedition. We can do so in a small way. We can and must send an expedition of some kind. We earnestly ask Her Majesty's Government to enable us to send a really efficient expedition.

Sir Joseph Hooker, who was President of the Royal Society, and who is, I may add, the last survivor of Sir James Ross's memorable Antarctic Expedition, will now address you on the same subject.

Sir Joseph Hooker: Mr. Balfour, I am prepared to echo every word which has passed the lips of Sir Clements Markham. The proposed Antarctic Expedition is strictly a scientific one, with a very practical point included, which Prof. Rücker will explain in due fulness. It is to aid in the exploration of a large circum-polar area of the globe, comprising no less than thirty degrees of latitude, of which we know only the outskirts very imperfectly, and nothing of the interior. That land and sea we know are covered with ice, and it has been held and urged, not unnaturally, that any attempt to penetrate into and explore a country which is utterly uninhabitable by man and animal is both futile and useless. That is not the opinion of those in search of knowledge. The very fact of that region being covered with ice shows that by its marine currents, and by its atmospheric currents, it is modifying the atmosphere of the whole southern hemisphere, and in conjunction with the action of a similar area, but a smaller one, in the north, it may be said to modify the atmosphere of the whole globe. Now, what is the object of our expedition? One great object is to find out what are the meteorological conditions of the vast area which produces such complex and such important results. This can only be done by a scientific expedition well fitted with proper instruments, and capable of using them. When that is done, we shall know more of the physical history of the southern regions than ever we knew before. The practical point to which I alluded is that of magnetism. We know that the deviation of the compass, which is so important to mariners, depends upon the position of the north and south magnetic poles, and that the south magnetic pole had its position ascertained approximately by Sir James Ross fifty or sixty years ago, and since

then we know that this position has moved, and it is most important that that which it now holds should be determined. But on this, Prof. Rücker, I am sure, will address you. Turning from the meteorology to the geology, we have this enormous area, of the geological history of which we know absolutely nothing. We do not know how far it can compare with the three great continents to the northward of it. We know that quite lately a few specimens of fossil plants and of fossil animals have been picked up, which assure us that there was a geological time when it was more or less covered with what are not there now—terrestrial animals and terrestrial plants. Certainly that point is a scientific and a most important one, and I think that this alone would justify the despatch of an expedition. With regard to the zoology of that region, Dr. Lankester is prepared to speak. With regard to the botany I have very little to say, but that is of very great importance. We know there is no terrestrial vegetation there except vestiges, no doubt wafted from the nearest continents; but the ocean teems with vegetable life, and that vegetable life is the foundation of all life in that ocean. The sea teems with myriads of microscopic diatomaceæ, whose silicious skeletons are forming future geological strata—great beds of stone. These minute animals are composed of an enormous number of genera and species which have yet to be investigated. They live in the ocean at all depths, apparently, and they occupy a most prominent place in the life of those regions. They are the food of the lowest animal organisms there, which again are the food of the higher. With regard to other objects of the expedition, I think they will be dwelt upon by persons here better fitted to do so than I am. There is only one point I would add, and that is that no time should be lost in sending out such an expedition. Other nations have sent out expeditions with which we should be in friendly rivalry—in co-operation; thus affording the hope that we shall thus secure comparative results, made at the same time in different portions of the south polar area.

Lord KELVIN: The primary object of antarctic exploration in the present day is to explore the southern boundary, the antarctic boundary of navigable waters. Germany, Belgium, and England have joined in this object. Surely, as Britannia rules the waves, it is of primary importance for England to take part in the exploration of her own realm. It is an object of the highest practical importance, in respect to navigation in southern waters, to know the real boundary of navigable seas. It is marvellous how little is yet known, because sailing vessels and steamers alike avoid going too far south for fear of being caught in the ice; but they do not know how far they may go, and it seems highly probable indeed that improved routes for navigation will be found by antarctic exploration of the cold southern boundary of the navigable waters. The sciences concerned, geographical, hydrographical, meteorological, magnetic, and the sciences of biology and geology, are all full of the most profound interest. We know that the primary object is, as I have said, the exploration of the southern boundary of navigable waters—that is the primary object only in point of space and time and action. The next thing is to know what lies beyond the boundary of the navigable waters. Pack-ice in many places great masses of ice—we do not know how much there may be. A good deal we learned from the *Challenger* Expedition, but we learned chiefly how much more there is to discover than anything the *Challenger* was able to find. Landing on the antarctic continent is a highly important object, perhaps not the most important of all, but one of the most important of all the objects. We do not know whether there is an antarctic continent or not. All we know about it is that which Sir James Ross taught us. In the expedition from 1839 to 1843 of the *Erebus* and *Terror*, with which Sir Joseph Hooker, who is now with us, was

present, Sir James Ross tried Cape Adare, lat. 72° S., just about due south of New Zealand, which is in long. 170° E. Sir James Ross at Cape Adare tried to land, but was prevented by 8 miles of pack-ice. He did not land and plant the British flag there, but he gave it the name of Victoria Land, and he sailed 6° S. to lat. 78°, past 360 miles of coast, and then turned eastward and coasted 400 miles. Thus we have 760 miles of Victoria Land explored from the sea. Many promising places for landing were indicated by Sir James Ross's sea exploration, and one of the objects of the present expedition is to land somewhere there—to try several different places—and to go inland to the south magnetic pole. That may be comparatively easy. To go to the true south antarctic pole may be a much easier thing than to go to the north pole, or may be much less easy; we do not know, but it is very unsatisfactory that we should not know the whole contents of the antarctic boundary of the line of navigable waters. Sir George Newnes's expedition has made a very excellent beginning in that direction. Sir George Newnes's expedition found Cape Adare clear of ice—more favourable circumstances than met Sir James Ross. They landed last February, and last February the commander of Sir George Newnes's expedition, Mr. Borchgrevinck, a Norwegian, actually landed at Cape Adare, the first landing on the southern continent, if it is a continent. He landed there and remained with the party to winter and explore, and he is there now exploring. I think really we should feel that, when so much has been done, it is an object of paramount practical and scientific and national importance that aid should be given to the expedition, and that whatever is necessary for making the expedition thoroughly effective should be found. I do hope and trust that the British Treasury will see that it is a proper expenditure of money to give thoroughly effective assistance to this work.

Prof. RAY LANKESTER: Mr. Balfour, I am asked to say a few words as to the results which may be expected in the direction of biological science, from such an expedition as that which is proposed in the antarctic regions. The main biological interest appears to me to depend upon the fact that we have at the two poles a body of sea-water under very similar conditions, that is to say, in contact with ice, therefore cooled to a very low degree, and presenting physical conditions which are identical; at the same time separated by tropical oceans, and therefore practically apparently cut off from one another. Now, so far as the exploration of the living contents of the antarctic ocean has gone, it appears that they are extremely numerous, extremely abundant, and yet have a most curious resemblance to those of the arctic region. This is not merely a parallelism of forms which are alike and similar to one another, but extends to actual identity. There are eleven species of fish which are found in the antarctic sea, and which are identical with species found in the arctic sea. Amongst these is a well-known fish called the king of the herrings (*Chimæra monstrosa*), and also the conger eel, the common dog-fish, and the sprat. Now, it is a matter of great interest to ascertain, or rather to get further grounds for forming an opinion, as to how this identity of fauna has come about between the living fauna of regions so far apart and separated by such totally different conditions as those which obtain in the regions themselves—I allude to the difference between the two polar seas and the tropical seas. Various speculations have been put forward to account for this. One is that certain deep cold currents traverse the warmer waters of the ocean and form hidden roadways, as it were, by which the arctic and antarctic faunas may communicate. Then, also, the opinion has been held that formerly there was a uniform fauna which was identical throughout the seas of the globe, and is now surviving at these two polar regions, having been superseded in the middle region and warmer regions of the ocean by the newly developed forms. That is a kind of problem which a further

exploration of the antarctic ocean would help us to solve. We have had very little real investigation of the antarctic region, certainly hardly any, by the improved methods of dredging and sounding, and of collecting living things, since Sir Joseph Hooker was there more than fifty years ago. The *Challenger* Expedition looked into this antarctic region, so to speak, but did not go very far, and was not able to remain very long, and there is no doubt that we only know the merest sampling of what exists in the antarctic sea. There is every reason to hope that an expedition which would be there for some time, well equipped with the present means of investigation, and of procuring living things, would bring home most interesting and important additions to our knowledge. Those, besides what may be expected from the fossil forms found in the rocks of that region, are the main points of biological interest in this Antarctic Expedition. No doubt we should obtain by such an expedition a great addition to our national museum of natural history, and the materials so produced would help to solve the problem which I have mentioned.

Prof. Rücker: I should like, in the first place, to say, Mr. Balfour, that this is a question upon which all magneticians are practically at one. I had the honour last year of being the President of an International Conference on Terrestrial Magnetism, which was held at Bristol, and I then had a very special opportunity of conversing with many of the best-known magneticians from the different European countries and from the United States. I think I may say that we were all agreed that the great outstanding want in our magnetic knowledge at present would be to a large extent met by a further exploration of the antarctic region. As you are aware, several countries are taking steps in this direction. As one of the representatives of the Royal Society—of whom two others are here, Sir M. Foster and Prof. Armstrong—I was present a year ago at a meeting of the great German academies at Göttingen. There the question of antarctic exploration was discussed, and I think my two colleagues will agree with me that the very greatest stress was laid upon English co-operation. It is not, indeed, contended that the two expeditions should go side by side, but that they should attack the southern pole from different points; and it is thought that by two simultaneous attacks, much better results can be obtained than if they were made at an interval of several years. Then, in the next place, with regard to the magnetic problem itself, without entering into any technical details, I may perhaps say, though no doubt you are aware of the fact, that the magnet, though it points approximately to the north, is continually altering in its position, pointing sometimes more to the east and sometimes to the west. If we are to get a knowledge of the magnetic state of the Earth which may enable us in the future to foretell magnetic phenomena, it must be by getting a series of pictures of the magnetic state of the Earth at regular intervals, and comparing the one with the other. The great want in the picture which we have at present is a knowledge of the magnetic state of the Earth around the south pole. The annual change in the direction in which the magnet points can be approximately determined at any place if you know it in the neighbourhood. But it so happens that at all the great land projections into the Southern ocean—Cape Horn, the Cape of Good Hope, and the Australian continent—the position of the magnet happens to be changing very little indeed at the present time, whereas we have sufficient evidence that very great changes are going on in the intermediate regions. We have been unable to study these changes, because the particular points at which we can with the greatest facility observe are points at which very little change is taking place. It is therefore necessary that observations should be made at sea, and one of the great difficulties which arise on this point is that, although, as has already been said, steam-navigation has enormously

increased our power of penetrating unknown regions, on the other hand, the introduction of iron ships has immensely diminished our power of taking satisfactory magnetic observations. In the old days observations could be made, roughly perhaps, but still with sufficient accuracy on a wooden ship; nowadays all the ships which go near the region we are discussing are of iron. It is, therefore, quite essential that there should be a special expedition, in which a ship specially constructed for the purpose of magnetic observation should be used; and by that means alone can we hope to get the results that are wanted. Further, I may add that the only observation which is generally made upon a ship is as to how much the magnet points away from the north; but it is necessary also to determine the vertical pull which is exerted upon the magnet, and also the magnitude of the horizontal force. These observations are not taken by ordinary seamen, and therefore they must be made by a special expedition. On all these grounds, therefore, I contend that there is the greatest possible need for such observations. I may add that, though such regions are not at present traversed by any large number of merchant vessels, nevertheless, there is a certain amount of traffic across the outskirts of the Southern ocean; and it is known that the ships thus engaged often go many miles out of their way, owing to the fact that the magnetic conditions of those regions are not known. I do not wish to lay too much stress upon this; but, nevertheless, it is true that in that very sunless region, where it is often difficult for the ships to determine their position by astronomical observations, the magnet practically fails them on account of our ignorance. The great scientific problem before us, as I have already hinted to you—though at present it is very much of a dream—is to learn to foretell what the magnet will do, and for this it is absolutely essential that we should know more about the magnetic conditions of the southern hemisphere. The methods of calculation which have been adopted for calculating the magnetic state of the Earth are not as useful as they otherwise would be, because we are unable to test the results, owing to our ignorance of the magnetic state of the southern regions. I can only add, both on account of the admitted ignorance of magneticians as to facts which an expedition could discover, on account of the magnitude of the problem involved, which is second only to the problem of gravitation, and on account of the practical results which would follow, an antarctic expedition is of the very greatest importance, and we may sincerely hope that the Government will be willing to help it.

Sir Clements Markham: We do not propose to take up your valuable time any longer. We sincerely trust, from what has been said, and what we have represented in our letter, that Her Majesty's Government will take our request into their favourable consideration.

Mr. Balfour: Sir Clements Markham, Sir Joseph Hooker, Lord Kelvin, and gentlemen, I am sorry that I am here alone to represent the Government, and that neither the Prime Minister nor the Chancellor of the Exchequer has been able to accompany me and to listen to the interesting and important expression of scientific views which has just been made by a body which I think we may say without exaggeration is, perhaps, as representative of English science at the present moment as any body that could well be collected into one chamber. I feel sure that had they been here they would have been deeply impressed by the opinions that you have put forth, and by the weight of authority which evidently lies behind those opinions. I can only trust that I shall be able to convey to them the full strength of the impression which you have made upon my mind.

I, for my own part, fully recognize that if, as I think, expeditions to the poles of the Earth or towards the poles of the Earth are eminently desirable both on practical and on purely scientific grounds, those expeditions are, perhaps, even

more important towards the antarctic pole than they are towards the arctic, for we know much less at present about the antarctic than we do about the arctic regions; and the actual area of this unknown but immense portion of the Earth's surface is much larger in the case of the southern than it is in the case of the northern pole. I gather, also, from what has fallen from more than one member of the deputation, that there are problems—meteorological and geological problems—connected with the antarctic regions which have no precise parallel, and cannot have a precise parallel, at the north pole, where the configuration of earth and ocean presents features so very different from those which meet us in the southern hemisphere.

I am not qualified to dogmatize upon the precise practical value of those magnetic investigations which Prof. Rücker has just explained to us, and on which the whole deputation lay so great and, as I think, such just emphasis. But I think it must be important to the world at large, and important most of all to that country which is especially interested in all that appertains to navigation, to carry out to the utmost in our power every scientific experiment which will enable us to navigate with security this vast oceanic area. So much, perhaps, is obvious. I, however, should not be representing my own personal convictions—and I am speaking in this matter only for myself—if I for a moment let it be thought that in my judgment the scientific investigations which directly, immediately, and obviously lead to some practical results, are the only ones which it is worthy of a great nation to pursue. I take a different view—a view based upon the scientific experience of the past. If our predecessors in the last two centuries had taken any narrowly utilitarian view of their work, it is manifest that our ignorance of the planet on which we live would be much more profound than it is at present; and it would not be creditable to an age which, above all other ages, flatters itself that it is scientific, if we were without reluctance to acquiesce in the total ignorance which now envelops us with regard to so enormous a portion of the southern hemisphere of our planet. For my own part, therefore, I entirely agree with all that has been said upon the important practical issues that may be anticipated from any expedition which we are able to send forth from these shores; but I by no means limit my interest to such practical results. The things that we go forth directly to observe, and with the fore-ordained intention of observing, are doubtless of the highest importance; but I should be greatly surprised if the expedition does not come across a great many phenomena which we did not expect to observe, and which will throw a novel light upon many of our most important scientific theories, meteorological, geological, biological, and magnetic.

If this expedition is sent forth, as I hope it will be, adequately equipped, it certainly should add to our satisfaction that we shall be able to co-operate with a German expedition animated by the same scientific interests as our own. Such co-operation is valuable, and must be valuable, from every point of view; and it will, among other things, have the effect of strengthening, if such strengthening be indeed necessary or possible, the cosmopolitan and international character of true science. It perhaps adds to my satisfaction, speaking for the moment simply as a politician, that, if I rightly understand the matter, there cannot be any territorial rivalry between any of the countries engaged in antarctic exploration; and that such rivalry as there may be, must be of a purely scientific character. I do not imagine that the most ardent advocate of Imperial expansion is likely to find a sphere for carrying out his ideas in Victoria Land or in the regions around Mounts Erebus and Terror. I do not know, gentlemen, that I need say anything more on the general aspect of the question. You will, I suppose, be glad that I should leave that general aspect, and say something definite as to the line the Government

propose to take in respect to the demand that you have come here to press upon them.

I confess I could wish that the Chancellor of the Exchequer were present to represent the views of the Exchequer upon this matter. After all, it is a question for him, and I should have been glad if he could have explained fully his views to you upon the present occasion. If he were here, I think he would say, and say in my opinion with great justice, that one of the difficulties that beset the Treasury whenever any new demand is made upon them, is that such a demand cannot be considered simply in itself and by itself, in consequence of that ineradicable tendency in human nature to found new claims upon ancient precedents. I know that the present Chancellor of the Exchequer—and every Chancellor of the Exchequer, I do not care who he may be—is never at liberty to consider a request made to him in its natural isolation. He is bound to consider it as possibly a precursor of other demands of a similar character.

I am sure, if the Chancellor of the Exchequer were here to-day, he would tell you that, if he can in any way meet the wishes of the deputation, such action on his part must be regarded, not as a reason for giving something more to some future deputation upon some other subject, but rather as a reason for giving less. But with that caution—which, in the absence of my right honourable friend, I feel bound to give on his behalf—I think I should be not raising undue hopes in the minds of my audience if I say that I believe the Chancellor of the Exchequer will find it in his power to give substantial aid to the great project which you have on hand. I do not of course say that that aid will reach the limit of the largest wishes or desires that have been expressed, but I hope and I believe that it will be sufficient to enable us to send out this expedition in a manner not unworthy either of the great Societies which have interested themselves in this project, or of those liberal members of the public who have subscribed out of their private means in its support; but also that it will not be unworthy of a country which has done more than any other country in the past to further expeditions similar in their character and in their objects to the one which you desire to send forth.

Sir Clements Markham having informally thanked the right honourable gentleman for his courtesy in receiving them, the deputation withdrew.

As a sequel to the deputation, the following letter has been received from the Treasury:—

Treasury Chambers, July 3, 1899.

My Lord,—

I am directed by the Lords Commissioners of Her Majesty's Treasury to inform you that the First Lord has laid before the Board the Memorial signed by your Lordship as President of the Royal Society, by the President of the Royal Geographical Society, and by other distinguished representatives of various branches of Science, by which Memorial application is made for a Government grant in aid of the expedition now being organized by the Royal Society and the Royal Geographical Society for the exploration of the antarctic regions. This application has received the careful consideration of Her Majesty's Government, and I am directed to inform you that they are prepared to ask Parliament for grants amounting, in all, to £45,000 towards the expenses of the proposed expedition, provided you are able to assure them that not less than an equal amount will be forthcoming from other sources, so as to enable the scheme to be efficiently carried out.

In making this announcement, I am to call attention to the latter part of the

speech of the First Lord to the deputation which waited on him on this subject, as indicating that Her Majesty's Government must not be regarded, in making this promise, as inaugurating a new era of more extensive grants than formerly from the Exchequer in aid of scientific enterprises. Rather, it is to be understood that the very exceptional importance of the present scheme, so strongly represented by the deputation, is being recognized by the promise of a special grant.

At the present time, it is only necessary to add that the applications to Parliament for instalments of the grant will be spread over four years, of which 1900–1901 will be the first.

I am to ask you to be so good as to communicate this decision to the other signatories of the Memorial.

I am, My Lord,
(Signed) FRANCIS MOWATT.

LORD LISTER,
President of the Royal Society,
Burlington House.

NOTES ON THE SURVEY OF COLONEL J. R. L. MACDONALD'S EXPEDITION.*

THE survey was a combination of compass traverses and plane-table work, supported by astronomical observations. The traverses were made by prismatic compass and pedometer, and were plotted to scales of from 4 to 2 geographical miles to the inch. The variations of the compasses were frequently checked by astronomical observations. Each officer had tested his pedometer readings over a known distance, and the difference of latitude also afforded an additional check. Altitudes of camps were taken by aneroid barometer, the height above the sea of Mumia's station, as given by the Preliminary Railway Survey of 1891–92, being taken as a datum point. Corrections were made according to the hour of observation for the diurnal wave, the curve for which was from time to time plotted. Heights of hills were obtained by triangulation with theodolite, allowance being made for curvature of earth and terrestrial refraction.

The traverse was plotted daily on to a plane-table sheet on a scale of 4 or 8 geographical miles to an inch, and the plane-table used to secure additional detail. The plane-table work also gave a check on the traverse work, whenever, as generally happened, intersections could be obtained from previously determined hills. In favourable ground this almost amounted to a plane-table triangulation. Observations for latitude were obtained by observing north and south stars with theodolite.

Time was obtained by observing the sun or stars with theodolite or sextant. Longitude was obtained for the most part by azimuths and difference of latitude. A great deal of the country traversed, with its prominent peaks, was very favourable for this method of determining longitude, especially as our routes had plenty of northing. Longitude by chronometer was also used. The rating of the chronometer was checked by azimuth and difference of latitude, as well as by observations repeated at the same points going and returning; as certain points were repeatedly visited, good opportunities for checking the marching rating occurred. Some very long bearings were obtained, notably two of about 100 miles each.

Absolute longitudes by occultations were frequently attempted, but were not successful owing to clouds.

The absolute longitude of Titi was determined by lunar distances. One observer took the distances by a [illegible]-inch sextant on a stand, while another simultaneously

* For paper, see p. 129; map, p. 240.

took the altitudes with a theodolite. The mean of the results differs by two minutes of arc from the longitude determined by azimuth and difference of latitude. The latter longitude is used in the map.

J. R. L. Macdonald, Lieut.-Colonel.

THE MONTHLY RECORD.

THE SOCIETY.

South Australia and the Antarctic Expedition.—Lord Tennyson, the Governor of South Australia, has at the request of the Adelaide Branch of the Royal Geographical Society of Australasia communicated to Sir Clements Markham, and to the Royal Geographical Society, the congratulations of the Adelaide Society on the success attending the efforts to equip a national Antarctic Expedition. In his speech at the annual meeting of the Branch in Adelaide, Lord Tennyson, who presided, gave an eloquent address on the functions of geographical societies and the importance of the study of geography. In concluding, he moved the congratulatory resolution in these words:—"Before I resume my seat I would respectfully ask you to grant me your authority, if it is found consistent with your business to-day, to forward the hearty congratulations of your Society to that most popular of all societies, the Royal Geographical Society of Great Britain, on their zeal and on the zeal of their president, Sir Clements Markham, on behalf of the proposed Antarctic Expedition, and on the co-operation with them of our Teutonic cousins, the German people, in that great scientific enterprise." This was unanimously agreed to.

EUROPE.

Vienna the Site of the Earliest Triangulation.—Some new facts respecting the earliest use of triangulation in surveys were brought forward by Siegmund Wellisch, in a paper read in April last before the Austrian Society of Engineers and Architects. It has previously been supposed that the discoverer of the use of triangulation was the Dutchman Willibrod Snellius, who as early as 1615 carried out his famous measurement of a degree by the aid of this method. Herr Wellisch, an Austrian engineer, has now proved, on the evidence of manuscript notices lately discovered, and by means of careful test measurements, that so far back as 1547, triangulation was already employed for the plan of the city of Vienna prepared in that year, of which the original engraving, on six copper-plates, is still preserved in the Vienna Museum. The author of the plan was the mechanic and engraver, Augustin Hirschvogel of Nürnberg, who had become domiciled in Vienna. Wellisch has proved beyond a doubt that Hirschvogel not only worked from the greater to the less in the measurement of angles, but also made use of the principle of back-sights in determining the position of the point of observation, both principles forming the essence of triangulation. The accuracy of the survey is very high, inasmuch as the average error amounts to no more than 5·4 per cent. Snellius still retains the honour of being the first to formulate the method of triangulation with academical precision, while to the Swabian Wilhelm Schickhart belongs the merit of having for the first time carried out a complete territorial survey (that of Württemberg of 1624–35) on the basis of an independent system of triangulation. England, too, takes a share in the history of the science in the person of John Collins and Richard

Townley (1671), while France can boast of her Laurent Pothenot (1692). The above-mentioned survey of Vienna, however, took place no less than sixty-eight years before Snellius carried on his operations, so that in point of time Hirschvogel occupies the first rank, and the city of Vienna must henceforth stand out as the place where the principle of triangulation was first employed.

Transformations in the Bay of Mont-Saint-Michel.—It is well known that great changes in the north-western coast-line of France have taken place since the commencement of our era, due in part to slow oscillations in the level of the land. A practical question has lately arisen in this connection, owing to the conflict between the utilitarian aims of those who desire to reclaim as much land as possible from the sea, and the more conservative views of the lovers of the picturesque. The locality in question is the neighbourhood of the Mont-Saint-Michel, which is likely to lose its romantic charm if the utilitarian schemes alluded to are carried out. A succinct review of the whole question, including a sketch of the changes which have taken place within historic times, appears in the fourteenth number of the *Tour du Monde* for the current year. There seems little doubt that in the time of the Romans, Alderney, Jersey, and the Chausey islets were all united to the mainland of Cotentin, while Guernsey and Sark formed but one island. The Bay of Mont-Saint-Michel, as far as the Chausey isles, was occupied by the forest of Scissy, traversed by a Roman road. The gradual lowering of the level of the land had already somewhat diminished its area when, in 709, after an earthquake, the sea covered all the low-lying parts of the coast, leaving only the rocks of Tombelaine and Mont-Saint-Michel still above the surface. The unusually strong tidal action in the bay has since brought in immense quantities of sand and detritus, and new land has gradually been formed. Reclamation had, however, been possible only on a small scale, until in 1856 a strong company obtained a concession, and, by the building of dykes, caused the sea to retreat at the rate of a kilometre in ten years. Already much damage has been done to the ramparts of Mont-Saint-Michel by the concentration of the tide into a narrower compass, and it is suggested that the principal dyke should be pierced for a distance of 200 yards, connection being supplied by a drawbridge. On the other hand, schemes are on foot for turning the whole bay into dry land, in which case the mount would be merely a rock rising above the coast-line. The most feasible scheme is for the construction of dykes from the Bec d'Andaine to the Tombelaine rock, and from the latter to Mont-Saint-Michel; but it remains to be seen whether the champions of the artistic or of the useful carry the day.

ASIA.

Flora and Fauna of the Altai.—Last year Mr. H. J. Elwes made a journey into the Altai for the purpose of studying the fauna and flora of the range, and a sketch of the chief results has appeared in the *Journal* of the Linnean Society (*Zoology*, April, 1899). Although the route followed led over no new ground, some interesting facts are mentioned respecting the physical features of the country, and the distribution of plants and animals therein. Mr. Elwes proceeded *viâ* Barnaul and Biisk to the headwaters of the Ob, his furthest point being near the source of the Chuja river, a tributary of the Katuna. It had been part of his programme to explore the little-known upper Yenesei, but guides were not to be found either for this region or for the journey across Northern Mongolia to Lake Kosso-gol. The Chuja rises in a wide open valley about 6000 feet above the sea, in which is a frontier market named Kuch Agach. From the bare and treeless mountains whence the Ob headwaters rise, the sources of the Irtish are said to have been seen, as well as those of the Kobdo river and of the Kemchik, though according to our maps they

would lie on the further side of the Southern Altai, itself visible 80 or 90 miles to the southward. Mr. Elwes places the eastern limit of the Altai at the boundary of the Government district of that name, but in so doing apparently leaves out of consideration the Southern Altai in Chinese territory. He is inclined to place the division between the eastern and western portions of the Holarctic Region further west than the Yenesei, as he found many species of butterflies and some birds previously only known from Dauria and Amurland. He paid special attention to the wild sheep (*Ovis ammon*) and to the great stag of the Altai, as to exact relationship of which opinions differ. The number of species of butterflies was surprisingly large, and the Alpine flora particularly brilliant. Both the fauna and flora are influenced by the great extremes of heat and cold in the Altai, and by the heavy snowstorms which occur throughout the summer. A marked change was noted on crossing the watershed between the Chuja and Bashkaus valleys, the vegetation becoming more European in character, while dense forests of pines and spruce took the place of the thin larch woods of the drier region. Mr. Elwes gives an incomplete list of the English travellers who preceded him in the Altai, omitting the names both of Atkinson * and Mr. Ney Elias. He is also incorrect in stating that Grum Grijimailo is the only European who has seen the wild horse of Prjevalsky in its native haunts.

M. Rijnhart's Journey in Eastern Tibet.—It may be remembered that when Captain Wellby and Lieut. Malcolm reached the borders of Kuku Nor, after their adventurous journey across Northern Tibet, they were hospitably received by a Dutch missionary named Rijnhart, then settled at Tankar, not far from the Kumbum monastery. He was then meditating a journey towards Lhasa, which he has since carried out, accompanied by his wife and infant son. The journey, of which a short account is given by M. Grenard in the *Comptes Rendus* of the Paris Geographical Society (1899, p. 124), was beset with hardships and dangers, and terminated disastrously, Madame Rijnhart having arrived alone at Ta-tsien-lu without certain knowledge of the fate of her husband, while their child had succumbed to the severe experiences undergone. The route followed cannot be laid down with certainty, but M. Grenard's knowledge of much of the country traversed enables him to throw considerable light on it. The party, after reaching Barong, in Tsaidam, took one or other of the routes to Lhasa, probably that followed by Prjevalsky and A—K, as it crossed the Chumar, one of the headstreams of the Yang-tse, and the well-known Tang-la pass. M. Rijnhart hoped, owing to the smallness of his party, to pass across the Lhasa territory unobserved, but the hope proved fallacious. After advancing southwards beyond the Ta-tsang pass (apparently the Tajang of A—K), he was forced to turn north-east by the northern route to Ta-tsien-lu—that followed in 1894 by MM. De Rhins and Grenard, the only Europeans who had previously travelled by it. After crossing three important streams, the Ta-chu (Dza-chu, or upper Mekong) was reached, and the party was attacked by Tibetans while attempting to find a practicable route across the stream. M. Rijnhart's men all fled, leaving him alone with his wife and one sorry horse. The river was crossed, but, seeing some tents on the opposite bank, M. Rijnhart re-crossed to endeavour to obtain assistance. Since then he was not seen again by his wife, who, after waiting several days and losing all hope, made her way, amid incredible difficulties, to Chinese territory. It is thus uncertain whether M. Rijnhart was murdered or merely taken prisoner by the Tibetans.

---

* That Atkinson's account was in the main trustworthy was the opinion of Mr. Elias, while his descriptions agree well with those of Mr. Elwes in the case of localities visited by both.

M. Bonin's Journey in China.—M. Bonin has during the last two years been engaged on a new journey of exploration in the Chinese empire, accounts of which have from time to time appeared in the *Comptes Rendus* of the Paris Geographical Society. From the first number for the present year we learn that from the upper Yang-tse above Swi-fu he has followed a hitherto undescribed route across the mountainous country of the Leang-Shan, inhabited by the Lolos, or Mantse, as he prefers to call them. He has collected information respecting this people which he hopes will fill up some blanks in our knowledge respecting them. The attack on his party by the Chinese necessitated a modification of his plans for entering Tibet (which he had hoped to do by way of Tali), as it became requisite for him to proceed to Ta-tsien-lu to communicate with the French Consul. *En route* for that place from Kien-chang (the Caindu of Polo), he hoped to travel still over new ground. A subsequent letter announces his return to Shanghai previous to carrying out the last part of his programme. In addition to the work done by M. Bonin himself, a survey of the Yang-tse above Swifu is said to have been carried out by Captain de Vaulserre, the second in command. A sketch-map of M. Bonin's route accompanies the first letter.

A Journey in Shantung.—An interesting journey in the Chinese province of Shantung, made last year by Herr Gaedertz, a German engineer, on behalf of a Hamburg syndicate interested in mining and railway construction, is described in Nos. 3–5 of *Petermanns Mitteilungen* for the current year. A preliminary trip was made to the walled city of Wei-hsien, one of the most important places on the route to Tsinan-fu, both from Kiau-chau and from Chifu. Skirting the eastern shores of Kiau-chau bay, Herr Gaedertz struck north-west from its northern point, and, after crossing the Ta-ku-ho, reached the Yuen-liang-ho—the canal which unites the former stream with the Kiau-ho, and thus the waters of Kiau-chau bay with those of the gulf of Pechili. In its present state the canal serves only as a drainage channel during the rains for the great plain through which it passes, and which is in great part inundated at that season. This would seem to be the origin of the Lake Pi-mu-ho, which has figured on former maps, but of which the traveller could hear nothing. The canal was always, in Herr Gaedertz's opinion, a one-level canal without locks. The plain, which extends to the Wei-ho, is mainly occupied by cornfields, the villages being embowered in fruit-trees. The soil appears to be chiefly loess, in which the track has worn deep gullies. The people were generally well-mannered, but inquisitive; apart from the missionaries, whom, as they wear the native dress, they do not regard as foreigners, they have rarely seen a European. After returning to the German port of Tsin-tau, Herr Gaedertz again reached Wei-hsien, this time by a more southerly route, crossing Kiau-chau bay and passing through the city of the same name. At Ma-tau, the new customs station north of the bay, an active trade in the country products was observed. After passing Ngan-kiu, a populous and busy town south of Wei-hsien, a steep ascent had to be made, and here the wheelbarrow-men took advantage of a strong southerly breeze as a means of propulsion by sails. On the plateau above both sandstone and limestone were met with. Beyond Wei-hsien the way led along the northern foot of a series of limestone escarpments, the cultivated plain extending northwards as far as the eye could reach. Tsing-chau-fu, famous as the seat of the Ming dynasty, and for its production of silk, was left to the south. It lies in a wide valley by which the mountains are broken. An ascent was made to the temple-crowned summit of the Yo-shan, from which a sea of mountains was visible to the south. Beyond Chau-tsun, a town of 50,000 inhabitants and the emporium of the silk trade of Shantung, it was resolved to follow the track to the south of the Chang-pei-shan, the eastern summit of which had been ascended from the town. The

track is at present impassable for carts, but the route is regarded as practicable for the proposed railway. After leaving the Chang-pei-shan the route again traversed a plain, with limestone mountains to the south, until Tsinan-fu, the capital of Shantung, was reached. The city lies only 2 miles south of the Hwang-ho, on which its port, Lo-kau, is situated. Herr Gaedertz gives useful information as to the trade of the city, which is carried on to a great extent by the Hsiau-hsing-ho canal, to which it comes *viâ* Chi-fu and Yang-kia-kau, a port of transhipment on the gulf of Pechili. Petroleum, paper, sugar, and English linen are the principal imports, but the amount of trade is less than that at Chau-tsun. Crossing the Hwang-ho, as to which stream and its dykes he gives interesting particulars, Herr Gaedertz proceeded north-west over a well-peopled plain to Te-chau, crossing *en route* several channels which carry off the surplus water of the Grand Canal. The return journey was made by a more northerly route, which, before reaching Chou-tsun, passed along the northern edge of the Chang-pei-shan. Beyond this an excursion was made southwards up the valley of the Hsiau-fu-ho to Po-shan, which lies in the centre of the coal district, and is the chief industrial town of the province. It has pottery, glass, and iron works. The rest of the route did not differ materially from those followed in the previous journeys.

Observations on Mount Kinabalu.—Mr. H. T. Burls, writing from Gaya island, North Borneo, on April 25, sends us a short account of his recent ascent of Mount Kinabalu, which he undertook for the purpose of geological observations. The altitude of this mountain was measured by Captain Belcher from the sea as 13,698 feet, and Dr. Haviland had in 1892 explored it to the summit for the purpose of making botanical collections.* Mr. Burls, whose description of the mountain agrees with that of his predecessors, succeeded in reaching a point where the boiling-point thermometer read 191°·9 at an air-temperature of 49°, giving an altitude of 11,643 feet. The distance to the summit he estimated at only 400 feet, which would give the total height of the mountain as 12,043 feet. The upper 1200 feet was a surface of bare rock so steep that it was impossible to walk on it with boots, and, being unprovided with any substitutes, Mr. Burls was obliged to give in after covering two-thirds of the distance; but his Chinese servant and four Dusan carriers completed the ascent, and brought back a number of small pellucid quartz crystals found in crevices of the rock on the summit. He believes that large specimens of such crystals may have given rise to the legend that a great diamond was to be found at the top of the mountain, guarded by a huge dragon, which devoured so many adventurous Chinamen who went in search of the diamond that the mountain came to be called Kina Balu, which means "Chinese Widow." Bad weather was experienced all the time of the ascent. While on the mountain Mr. Burls never saw the sun after 11 a.m., when the summit became densely enveloped in mist, and before that hour the mist lay low over the surrounding country, a fully illuminated view of which could not be obtained. Rain fell every afternoon, and the damp threatened to spoil the photographs which were taken. The natives at Kiau said that it rains every afternoon throughout the year, but the season was a particularly wet one and the rain very heavy; on one occasion 2·06 inches of rain were collected in two and a half hours. The lowest temperature recorded was 44° on the night of April 13, at an elevation of 10,360 feet. Mr. Burls says that the central core of the mountain, which is of syenite, seems from a distance to be table-topped. His object was to see whether the sides were covered with sedimentary rocks, or whether there was any extensive area of metamorphic rock surrounding the mountain. He did not find

* See Dr. O. Stapf, "On the Flora of Mount Kinabalu," *Trans. Linnean Soc. Botany*, vol. iv. pt. 2, 1894.

any metamorphic rock; at 8800 feet there was a direct transition from limestone to syenite, the change being clearly marked by the form of the ground. The central peak is very ancient, and probably stood up as an island in the Devonian or Carboniferous sea in which the limestone was laid down. The limestone appears to be underlain by a shale, followed by a sandstone at 7175 feet; and Mr. Burls is of opinion that the original formation may have been that of a fringing reef.

AFRICA.

The Egyptian Sudan.—An instructive report on the Sudan, by Sir William Garstin, Under-Secretary for Public Works in Egypt, has lately been issued as a Parliamentary Paper. The first part is descriptive, and gives a detailed account of the hydrography, native tribes, resources, etc., of the region of the upper Nile, based on the latest information obtained early in the present year. The information with regard to the present state of the channel of the upper Nile and those of its tributaries, is especially useful. In March the Sobat had a depth of 20 feet, but its current was feeble, its waters being held back by those of the Nile. In flood-time the Sobat drives the Nile water on to the western bank, and its milky-white water (to which the eventual colour of the White Nile is largely due) is for a long distance separated from the greenish-black water of the Nile by a sharp line. It is not navigable in the dry season, but its discharge must at times be very considerable. The fort on its south bank is occupied by eighty men, whose health, despite the surrounding swamps, continues to be good. The Bahr-el-Zaraf is from 40 to 50 yards in width at the junction, and is apparently discharging more water than the Bahr-el-Jebel, or true Nile, probably because the latter is now blocked by the *sudd*. This begins within a few hundred yards of its debouchure into Lake No, and the closure of the water-surface is complete, the mass being perhaps 4 feet thick. At low water the Bahr-el-Ghazal has a depth of 8 feet, but in March its current was hardly perceptible. The writer lays stress on the great fertility of the land along the Blue Nile, which he thinks eminently adapted for wheat-cultivation. Wad Medani, on its west bank, 147 miles from Khartum, is the largest and most important town upon the Blue Nile, and seems to have almost taken the place which Sennar once held. Built on a high ridge of sand and gravel, it is regarded as the healthiest in the Gezireh. In the second part of the report, which deals with possible developments and the future of the Sudan, much attention is paid to the swamps of the upper Nile, and the possibility of improving the water-supply in Egypt by confining the river to one channel is discussed. Sir William Garstin lays stress on the loss of water by evaporation in the marshes, and thinks that the measures suggested might increase the supply during the summer months without risk of raising the flood-level of the river. On the Blue Nile irrigation is needed for the winter cultivation of wheat, and at this season Egypt could well spare the needed water-supply. A barrage might be constructed somewhere between Rosaires and Sennar. Progress in the Sudan must necessarily be slow, and an insufficient population must for years be the chief obstacle to prosperity. It is to be feared that the climate will levy a heavy toll in the shape of valuable lives, but the results to be hoped for should well repay the sacrifice.

The Nemensha Country, Algeria.—An instructive sketch of the physical and human geography of the Nemensha country, in the province of Constantine, is given by M. J. Blazac in *Annales de Géographie* (March 15, 1899). The district in question, which lies to the east of the Aures mountains, is really, M. Blazac says, quite distinct from the latter, which are formed by a series of anticlinal chains and synclinal depressions running from south-west to north-east, and due to a thrust from north-west to south-east, whereas in the north of the Nemensha

country a thrust in the perpendicular direction has also made itself felt, resulting in three anticlinal domes. Similar structures abound in Tunisia and in part of the province of Constantine, but those now under consideration form the southernmost outposts of the series. Owing to the effects of denudation, they have lost all their upper strata (Lower Eocene and Upper Cretaceous), and now form elliptical plains, sharply defined at the margin by continuous lines of heights, whilst older deposits (probably Trias) rise in isolated ridges from their centres. They are separated from each other by narrow synclinal depressions, which retain the newer strata, whilst a wider valley of the same character separates the westernmost plain from the Aures system. South of the domes lies the Nemensha plateau, on which the Eocene limestones become nearly horizontal, until they suddenly plunge beneath the sands of the Sahara. The drainage of the district is southwards towards the Shotts of Melrir and Rarsa. The collected waters of the three plains are in each case discharged through narrow gaps in the bounding heights, and the streams then as a rule traverse the plateau by deep gorges. The economic value of the district is very slight. It is entirely devoid of wood, the greater part of the surface being covered with *alfa*. The strata which once formed the cores of the domes and now appear above the surface of the plains abound in gypsum and various salts, and the streams which rise in them render much of the soil unsuitable for cultivation, though producing some pasturage. The population is generally grouped round the margin of the plains, where most of the springs emerge from the line of contact of the Cretaceous and Eocene formations. On the plateau the inhabitants become more and more scanty towards the south. The whole country was, however, occupied by the Romans, and the Nemenshas are probably Berbers, with some Roman blood in their veins. Ruins of old forts, probably intended as posts of surveillance against the predatory *Gaetuli* of the desert, are still seen in the cañons of the Wed Hallail.

Dr. Fischer's Journey in Marocco.—We learn from *Petermanns Mitteilungen* (1899, p. 161) that Dr. Fischer, whose journey in Marocco was referred to in the June number of the *Journal* (vol. xiii. p. 660), has returned to Germany with a rich harvest of results regarding the physical geography, topography, and climatology of the country. During his stay at Marakesh, where he was joined by Count Pfeil and Hauptmann Wimmer, he had been able to collect material for a large-scale map of the neighbouring country, which has been somewhat neglected by previous travellers. He also gained an insight into the history of the area of depression on the inner side of the Atlas, and its filling up by vast diluvial deposits. Having obtained the Sultan's letter of recommendation, the travellers went east to Demnat, and thence west-north-west to the Um-er-Rebia. Following where possible the little-known course of that stream, they reached Casablanca after an arduous march of thirteen days, during which intense heat was experienced. On the middle course of the river, where it flows through a vast steppe, a sun temperature of 150° Fahr. was registered in April. From Casablanca the coast was followed to Rabat, whence Dr. Fischer and Hauptmann Wimmer proceeded over the Gharb plain to Mekinez, and thence to Fez. One of the most important discoveries was that of a zone of black earth, of astonishing fertility, which stretches parallel to the coast from the Tensift to the Sebu. Samples of this earth have been brought home by Dr. Fischer to experiment upon. The luxuriance of the corn grown in the black-earth tract is due to the excessive deposit of dew, caused by the belt of cold water rising from the ocean depths.

The Uganda Railway.—The recently issued report by Sir G. Molesworth, who was last year commissioned by the Uganda Railway Committee to carry out a thorough examination of the position and prospects of the undertaking, supplies

welcome information on a variety of points connected with it. Particularly useful are the maps showing the exact route hitherto followed by the railway; for, although in the main the line suggested by Colonel Macdonald as the result of his reconnaissance has been adopted, numerous deviations have been shown to be necessary by the more detailed examination of the country which has since been carried out. This, as Sir G. Molesworth points out, was only to be expected considering the conditions under which the reconnaissance was executed, and he pays a high tribute to the care and ability with which this work was performed. The principal deviations are as follows: In surmounting the Rabai hills the railway runs along the water-shed, thus avoiding the cross-drainage and ravines. Near the Voi river the adopted route differs from both alternatives suggested by Macdonald, while the detailed examination of the Kikuyu escarpment has resulted in the discovery of a much easier descent than that first adopted, the line now staked out being described as a masterpiece of engineering skill. As is already known, an important modification has been introduced as regards the final section of the route by taking it across the Mau escarpment to Ugowe bay, but this section has not yet advanced beyond the reconnaissance stage. Sir G. Molesworth lays stress on the exceptional difficulties which have been encountered in the construction of the line, the country traversed being in great measure desert, sparsely populated, waterless and without resources, while a large portion of it is fatal to all transport animals. The great elevation to be attained, the sudden ascents and descents, the severity of the gradients and sharpness of the curves necessary to avoid expensive construction, involve difficulties equal to those of a mountain railway. In many places temporary diversions have been necessary in order to maintain progress; at the Kikuyu escarpment, *e.g.*, a rope incline will be employed for the lowering of the permanent-way materials. Other points touched upon are the difficult questions of water-supply, transport, employment of local labour, etc. The great importance of the railway as a civilizing agent is insisted upon, as well as the desirability, in the interests of the country, of its remaining under Government control. In view of the unsuitability of the present port of Mombasa, it is suggested that Kilindini, the railway terminus, should replace the former as the main distributing centre, the interests of Mombasa as regards dhow traffic being, however, safeguarded by the construction of a branch line on the same gauge as the main railway. A survey of Lake Victoria is also needed, and the question of water-communication on the lake requires prompt attention.

French Explorations on the Ivory Coast.—French explorers have during the last few years shown considerable activity in the interior of the Ivory Coast, with the double object of elucidating the geography of the Franco-Liberian frontier, and of discovering the best means of communication between the coast and the southern parts of the French Sudan. In 1896 an expedition was organized under Lieut. Blondiaux to reach the region in question from the north, and in February, 1897, the extreme outpost from this direction was reached. A sketch of the expedition appears in the first number of the *Comptes Rendus* of the Paris Geographical Society for the current year. Lieut. Blondiaux and his associates made extensive journeys in the basins of the Ivory Coast streams, on the hydrography of which much new light was thrown. The most important discovery was that the Feredu-guba and other streams, which have been supposed to unite to form the upper Kavalli, really belong to the basin of the Sassandra, more to the east, which is therefore a stream of some importance. The Kavalli has its sources further west than has been supposed, being formed by the junction of the Diwu, which rises in the Nienimeba mountains, and describes the arc of a circle before flowing south, and the Nuon. The expedition surveyed the water-parting between the basins of the St.

Paul and Sassandra, which in part forms the Liberian frontier, and also explored the headwaters of the Bagoe, which rises in the Noölu mountains, whence it emerges by a narrow gorge. The French authorities, as we learn from a recent number of the *Bulletin de l'Afrique Française*, have lately decided to follow up M. Blondiaux's explorations by despatching an expedition under Lieuts. Woelfel and Mangin. From the south the exploration of the Kavalli has been prosecuted by MM. Hostains and d'Ollone, while further east an expedition under Captain Houdaille has executed surveys for a railway intended to tap the commerce of the bend of the Niger, as well as of the upper Komoe and Bandama basins (*C.R.*, Paris G.S., 1899, p. 166). The line will start from Grand Bassam and run north-west to Mope, in the Attie country, west of the Komoe. Thence Captain Houdaille recommends the construction of two branches, which may eventually reach Kong from the east and west respectively; but at present it is unnecessary, he thinks, to carry the line as far as that town. The forests through which the line would pass are said to be rich in timber.

Lakes in the Kasai Basin.—A characteristic feature of the river-system of the Kasai and Lulua near the junction of the two streams, seems to be the formation of lacustrine expansions of many of the river-beds. A series of such lakes, which are as a rule of comparatively small dimensions, has been brought to light by Mr. Verner, an American Presbyterian missionary of the Luebo mission, who has communicated some facts respecting them to the *Belgique Coloniale* (1898, p. 271, and 1899, p. 54). Two of the lakes occur near the mouths of the Lumi and Ikenye, which flow from the east into the Lulua and Kasai respectively near their junction. They are formed by the damming back of the waters by the large amount of sediment deposited at the mouths of the two streams mentioned. Others, which are drained by a tributary of the Kasai above the junction, seem to occupy fissures in the line of mountains south of the Lulua. An expansion of the Kasai at its junction with the latter has been named by Mr. Verner Lapsley Pool, after the founder of the mission, while that on the Ikenye has been named after Senator Morgan, who, as the United States representative in Brussels, took a foremost part in the recognition of the Congo State as an independent Power.

New Railway Project for the Congo State.—A recent number of the *Mouvement Géographique* (1899, No. 26) contains information respecting a newly adopted project for opening up communication with the eastern parts of the Congo State by means of a railway. On the completion, a year ago, of the Lower Congo railway, which, in conjunction with steamer navigation in the middle basin of the river, now supplies rapid means of transport as far as Stanley falls, schemes were suggested for the extension of communication with the more outlying parts of the territory. The principal lines of railway then considered desirable were, one to Lake Tanganyika from the highest navigable point on the Kasai system, and a second to the upper Nile by way of the Welle. For these is now substituted a single scheme, which aims at effecting both objects. From Stanley falls it is proposed to construct a line eastward through the great forest to a point near the watershed in the direction of the Central African lakes, whence it would branch north and south to Lakes Albert and Tanganyika respectively. Such a scheme is bound to present great difficulties, the length of the lines being estimated at 2000 kilometres, or 1250 miles. A study of the route has, however, been decided upon, and for this purpose M. Adam, an experienced engineer, started for the Congo early this year, supported by an efficient staff.

A Game-preserve in British Central Africa.—An order has been issued by the authorities in Northern Rhodesia, setting apart the great Mweru swamp, between the lake of the same name and Tanganyika, as a game-preserve, shooting

being allowed there only by special permission. It is hoped that by this means the elephant and other large mammals of Central Africa may be saved from extermination.

AMERICA.

The Everglades of Florida.—The latest contribution to our knowledge of the strange country which occupies the southern portion of Florida is a pleasantly written narrative of a journey made across the "Everglades" in the winter of 1897–98, by Lieut. Hugh L. Willoughby, late of the Rhode Island Naval Reserve. Owing to the peculiarly difficult nature of the country, a considerable portion of its surface had been absolutely untraversed by white men, though affording a safe asylum to the last remnant of Seminole Indians. The two previous expeditions—that of Major Williams (1883) and of Mr. Ingraham (1892)—had traversed the western and northern parts of that region, but the central and south-eastern portions had remained unknown, various legends being current as to the existence of fertile islands amid the sea of grass and water. Lieut. Willoughby therefore resolved to cross in a north-easterly direction from the western to the eastern coast of the peninsula. Having provided himself with two specially constructed Canadian canoes, and secured the services of a hunter named Brewer, he sailed, in a small sloop, round the southern coasts of Florida and up the Harney river, which debouches amidst the "Thousand island archipelago." *En route* he made an unsuccessful attempt to secure specimens of the American crocodile, which has its sole habitat in the little-known creeks and sounds by which the coast is fringed, and also spent some time surveying the labyrinth of channels which intersect the archipelago above-mentioned. His main work began, however, on reaching the source of the Harney river in the mysterious Everglades. Heavy bunches of grass, including the dreaded saw-grass, were soon encountered, and the whole trip was a constant battle with this formidable obstacle, which is often almost impenetrable. The substratum of the whole region is coralline limestone, above which is a varying layer of mud (occasionally absent altogether) water covering the whole except where occasional islets rise a few feet above the general level. The vast body of water cannot be accounted for by the rains only, and large quantities were often seen welling up from holes in the limestone. The popular impression that the Everglades form a vast malarious swamp is, Lieut. Willoughby says, totally incorrect. The water is pure, and no stagnant pools can be found, while in the daytime the cool breeze has an undisturbed sweep. After five days' travel the canoes had reached the centre of the tract, but an impenetrable line of saw-grass, running north and south, then necessitated a long zigzag southwards. Later the shallowness of the water caused another difficulty, and it was only after strenuous exertions that the edge of the firm ground on the east was reached at the end of the thirteenth day. The book contains some details respecting the animal life of the Everglades, the principal forms seen being terrapins and turtle, otter, cormorants, blue heron, and a large rail known as the limpkin. Deer were frequently started, some being seen in the very centre of the Everglades; while snakes, some of very large size, abound. The illustrations, from the author's photographs, give a vivid idea of the unique nature of this tract of country.

The Increase of Aridity in the Western United States.—In a recent article in the *National Geographic Magazine* (May, 1899), Mr. J. B. Leiberg examines the evidence of the forests as indicating that a progressive change of climate in the direction of aridity is observable at the present day. The title of the paper, "Is Climatic Aridity impending on the Pacific Slope?" suggests the treatment of the question, at the outset at least, as an open one; whereas the writer practically takes for granted the fact that aridity is progressing, and merely shows the effects

noticeable in the case of forests. Dividing the area under consideration into zones, according to the amount of atmospheric precipitation, he examines each in order, and notes the disturbances of equilibrium manifested by the characteristic species of trees, which are almost everywhere conifers. The comparatively few species represented, therefore, leaves a very narrow margin for the evolution of new forms, most of the types west of the Rocky mountains possessing the power of adaptation only in a very limited degree; so that complete deforestation is the ultimate result of the encroachment of arid conditions. The extinction of species within given areas is marked by gradual loss of reproductive power in the individual trees, resulting first in the crowding back to more humid tracts of the most decidedly moisture-loving species, and next in the gradual extinction of those by which they are replaced. Of the five zones defined, the arid regions are now bare of trees, but present evidence of having once borne a forest covering. The semi-arid tracts—covered only with junipers—show a gradual diminution in the extent and density of the forests, which consist mainly of old trees. In the sub-humid belts, two of the characteristic species exhibit clear traces of yielding to the semi-aridity, while two others are doomed to still more rapid extinction owing to their inability to adapt themselves to changes of temperature. The lodge-pole pine (*Pinus Murrayana*) possesses the highest power of adaptability, and promises to become the dominant species throughout both the sub-humid and humid tracts. In the last-named, which are chiefly limited to the mountain regions, not only are traces of the encroachment of sub-humid conditions apparent, but occasionally spots of true aridity occur. Many of the trees and shrubs of the lower belts have penetrated to the humid tracts, while the typically humid forests present detached groups, entirely surrounded by forests of other types. In the Bitter Root mountains the absence of a timber-line even at a height of 10,000 feet accords with a possible rise of mean annual temperature consequent on the extension of drier conditions. It may be noted that in another paper in the same magazine, Mr. H. Gannett remarks that the present temperature and moisture conditions do not appear to meet the requirements of the red-wood forests of the coast, of which he gives an interesting description.

The Franco-Brazilian Contested Territory.—A short account of the territory under dispute between France and Brazil, by M. S. Brousseau, appears in the March number of the *Comptes Rendus* of the Paris Geographical Society. After referring to the discovery of gold in 1894 by Clement Tamba, an illiterate Negro of Cayenne, and Pierre Villiers, also of that town, by which discovery the public attention was at once turned to the disputed territory, M. Brousseau sketches briefly the physical features, geology, and native population of the country, his knowledge of which is based on journeys made in 1894. During these journeys, he was able to fix the position of the sources of most of the streams between the Oyapok and the Amazon. The geological formations represented in the territory are, as in French Guiana, mainly Laurentian and Huronian, and consist of gneiss and granite, with schists, ferruginous sandstone, etc., and eruptive masses of diorite, diabase, and quartz. The climate is said to be most healthy, thanks to the action of the sea-breezes. The present French claim extends over the whole country south of Dutch and British Guiana, as far as the Rio Branco, and is based solely, as regards the interior, on certain ambiguous clauses in the treaty of Utrecht, no pretext of actual occupation being, of course, possible. As, therefore, the contested territory adjoins, in part, the possessions of Great Britain and Holland, these two powers are, to a certain extent, interested as well as Brazil in the final settlement of the question.

Italian Expedition to the Amazon Valley.—We learn from the *Bolletino*

of the Italian Geographical Society, that a scientific expedition, under Dr. L. Buscalione, set out in March last for the Amazon valley. The principal objects of the journey are botanical, and the region specially chosen for research is the province of Manaos. It is hoped, however, that some results of geographical value will be obtained by Dr. Buscalione, who is supported by a grant from the Italian Geographical Society.

Recent Explorations on the Madre-de-Dios.—Much attention has of late years been paid to the investigation of the river-system of the Madre-de-Dios, on a correct knowledge of which the ultimate determination of the boundary between Peru and Bolivia depends. The explorations of Colonel Pando in 1892–93, and of Colonel Muños in 1894, have been already referred to in the *Journal* (vol. vii. p. 187, and vol. x. p. 443). From the second of these it appeared probable that Colonel Pando was in error in identifying a tributary which entered the main stream in 69° 43′ W. of Greenwich with the Inambari, and the correctness of this surmise has since been proved by Colonel Pando himself. This officer was in 1897 commissioned by the Bolivian Government to continue his explorations, in conjunction with Señor Varnoux, and especially to fix astronomically the position of the confluence of the Inambari with the Madre-de-Dios. A pamphlet was last year published by the Geographical Society of La Paz, containing a report on the first stage of Colonel Pando's expedition, from which some idea may be gathered of the results of his explorations, though all the details are not quite clear. The expedition divided near the part of the Cordillera whence spring the Tuichi, Saqui, and Sina, Señor Varnoux being commissioned to explore the sources of these streams, while Colonel Pando proceeded by way of Buturo, on the Tuichi, to the lower course of the Saqui, the direction of which had previously been matter of doubt. This journey led to the exploration of a number of streams, including the Saqui, or Tambopata, which unite in a magnificent valley before entering the plain, and finally join the Madre-de-Dios in 69° 43′ W., the mouth of the Inambari being further west. The Heath and Madidi are both streams of the second rank, and take their rise in the last spurs of the chain which dominates the plain of Caupolican. We have not yet received details respecting the conclusion of Colonel Pando's exploration, but a recent number of the *Comptes Rendus* of the Paris Geographical Society (1899, No. 4) contains the account of a journey undertaken in 1897 by M. Villerobe, on behalf of a French syndicate, with a view to finding a good trade route from the Amazon to Northern Bolivia, by way of the Ucayali and Madre-de-Dios. From Cuzco M. Villerobe proceeded north to Iquitos, and then, reascending the Ucayali and Urubamba, crossed the narrow watershed which separates the latter from the Manu. This stream was descended into the Madre-de-Dios, which was itself followed downwards to the Madeira. A stream entering from the south was taken for the Marcapata, whilst the Inambari, whose mouth, M. Villerobe says, no European had hitherto seen, was reached three days later. It was ascended for six days, a chain of snowy mountains being visible to the south after the third day. In spite of its great volume, the river is useless for navigation, by reason of the violence of its current. On account of its large size, M. Villerobe gives its name (Inambari) to the lower course of the Madre-de-Dios, the use of which latter name he somewhat unsuitably limits to the upper branch which descends from the direction of Cuzco. For communication with Europe, he favours the idea of a light railway from the Aquiry to the mouth of the Orton.

Disaster to an Expedition in the Gran Chaco.—An expedition for the survey of the Pilcomayo river, under the leadership of Signor Enrique Ibarreta, has, it is said, been massacred by the Indians of the Chaco, on the borders of Argentina and Paraguay. No news having been received of the expedition for

some time, an auxiliary party was despatched to make inquiries, with the result that the fears which had been felt for the explorer and his companions were confirmed.

AUSTRALASIA AND OCEANIC ISLANDS.

Exploring Expedition to the Pacific Ocean.—Arrangements are now being completed by the United States Commission of Fish and Fisheries for a marine scientific expedition to the mid-Pacific ocean. The Fish Commission steamer *Albatross* is to be employed for the work. We learn from a recent article in *Science* that the *Albatross* will sail from San Francisco about the middle of August. On the passage to Tahiti, dredging and sounding will be carried on at regular intervals on an almost wholly unexplored section of the sea-bottom. Tahiti will be made the headquarters while the Paumotu islands are being explored. After returning to the Society islands, the *Albatross* will visit the Tonga, or Friendly islands. The vessel will next sail for the Fiji islands, and from thence to the Marshall islands, visiting a number of the Ellice and Gilbert islands on the way. Six or seven weeks will be devoted to the exploration of the Marshall islands, about whose fauna very little is known. Between the Marshall islands and the Hawaiian islands, and between the latter and San Francisco, a distance of over 4000 miles, a line of deep-sea dredgings will be run. Prof. Alexander Agassiz is to have charge of the scientific work. The *Albatross* is expected to return to the United States early in April, 1900, after a voyage of 20,000 miles.

Relics of La Pérouse's Expedition.—It is stated that the British yacht *Lady St. Aubyn*, which returned to Sydney at the end of last year from a cruise in the Pacific, brought from Vanikoro, in the Santa Cruz group, a large number of relics of La Pérouse's celebrated expedition. They consist of musket-balls and portions of muskets, gold and silver coins, etc.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Mechanical Composition of Wind-deposits.—The results of an investigation on this subject, carried out by J. A. Udden, have lately been published in Rock island, Illinois, as the first number of the Augustana Library Publications. The object of the study was to discover how the mechanical composition of wind-deposits changes under varying circumstances of deposition, with a view to the more certain identification of such sediments, wherever found. Samples of different kinds of material, including gravels, sand, and atmospheric dust, were collected and separated into grades of different coarseness, the percentage of weight for each grade being then determined. Eleven different grades were defined according to the size of the particles, from coarse gravel with a diameter of 8 to 4 mm. ($\frac{5}{16}$ to $\frac{5}{32}$ inch), to very fine dust, varying between $\frac{1}{128}$ to $\frac{1}{256}$ mm. The results are given in the form of tables, showing both in figures and diagrammatically the proportions of each grade in each sample. It was found throughout that a certain grade was present in greatest quantity, while the other grades were less represented in proportion to their distance from the medium. Summing up the results of the study, the writer points out that the great effectiveness of the atmosphere as a sorting agent tends to produce uniformity in the deposits, lamination being rarely if ever seen except in drifting dunes. The sediments are also rendered uniform by the elimination of the finest particles, very fine dust rarely exceeding 3 per cent. of the total weight, and not being specially abundant even in the case of material caught on the calmest days. The finest sand is probably never carried at a single leap more than a few miles, while dust may, according to its degree of fineness, be carried 200 to 1000

miles, or even round the globe. The different grades of materials are so far separated from each other in the direction of wind-movement, that even with considerable changes in velocity, the principal areas of deposition of the different grades will on the whole remain distinct. Mr. Udden remarks in conclusion that the loess of the Mississippi valley resembles atmospheric sediments considerably in its mechanical composition, although a more complete study of the work performed by the atmosphere must precede a final verdict on the origin of that formation.

GENERAL.

Old Geographical Documents in Switzerland.—A recent visit to some of the most important Swiss libraries and museums, undertaken by M. Gabriel Marcel during a mission from the French Minister of Foreign Affairs, has led to the discovery of some interesting geographical documents of which the existence was not generally known. These are briefly described by M. Marcel in the first number of the *Bulletin* of the Paris Geographical Society for the present year. The State Museum at Zurich was first visited, and here M. Marcel was struck by the sight of three globes of unusual size. Two of these proved to be reductions of the great terrestrial globes of Coronelli now in Paris, but the third turned out to offer a greater interest, being apparently quite unique. The stand bears the date 1595, but it is possible that the globe itself is earlier. An examination showed a surprising resemblance to the well-known map of the world brought out by Mercator in 1569, and a detailed comparison of the legends showed their almost absolute identity with those of Mercator's map. Of the history of the globe, which has never before been described, nothing seems to be known, and it is impossible to decide whether it was the work of Mercator himself (possibly finished by his son Rumold) or merely a copy, on a spherical projection, of his planisphere. Another interesting discovery at Zurich was that of an atlas, of date 1321, by Perinus (not Petrus) Vesconte of Venice. It contains five sheets delineating the coasts of Europe and of neighbouring parts of Asia and Africa, and is perhaps the only atlas of the thirteenth century which has come down to us in such a complete state. Especially interesting is the evidence supplied by the leathern loops attached, that such atlases were constantly carried about with them by the pilots of those days. At Basle the discovery was made of a copy, in perfect preservation, of Mercator's 1569 planisphere above alluded to, only two copies—in far inferior condition—having been previously known to exist. The atlas in which this map is folded contains also, among other important documents, Mercator's great map of Europe—not the 1554 edition, of which the only known copy was found at Breslau in 1891—but the second edition of 1572, of which no copy had been known to exist. At Basle was found also an apparently unknown cordiform map by Ortelius dated 1564, together with a reduction of the same published by De Judaeis in 1571, a date subsequent to that of the latest hitherto known cordiform maps. M. Marcel concludes with the description of three silver drinking-goblets in the form of globes opening at the equator, which are preserved in the Historical Museum at Basle, and of another of the same class to be found at the Zurich museum. This last was the work of Abraham Gessner (1552–1614), and dates evidently from the last quarter of the sixteenth century. It bears some features characteristic of the cordiform maps of Finaeus and Mercator. Photographic representations of this, and of the Zurich globe above described, accompany the paper.

Erratum.—In the *Journal* for July, p. 34, line 3 from top, for *Bucholleia coriacea* read *Buddleia coriacea.*

OBITUARY.

Sir William Flower, K.C.B., F.R.S.

Sir William Flower, until recently Director of the Natural History Department of the British Museum, died on July 1, after a long period of failing health. He was born at Stratford-on-Avon on November 30, 1831, and served in the Crimean war as an assistant-surgeon. In 1861 he was appointed Curator of the Hunterian Museum of the Royal College of Surgeons, and in 1884 he became Director of the Natural History Museum. While his work lay largely in the direction of research in comparative anatomy and in the organization of museums, he took a keen and growing interest in anthropology—he was President of the Anthropological Institute—and geographical distribution. In 1889 he became a Fellow of the Royal Geographical Society, and was a frequent speaker at the meetings of the Society. Under his directorship the Natural History Museum did much to encourage scientific studies on the part of travellers in remote countries, and he was always ready to co-operate in the organization of expeditions and in working up the collections brought home by explorers. He also did all in his power to encourage the assistants in the Museum to undertake scientific journeys, and geographical science has been not a little advanced by the studies of Mr. George Murray in the West Indies, Dr. J. W. Gregory in East Africa, Mr. C. W. Andrews in Christmas Island, and others in different parts of the world. By his liberal views of the position of a great museum as an incentive to research as well as a place for study, Sir William Flower helped to place geography in its proper position with respect to the other sciences. On the last occasion on which he addressed the Society, when speaking of Dr. Donaldson Smith's natural history work in the Lake Rudolf district, he expressed his views on this subject in these words—

"A collection of this kind must not be valued only by the number of new species it contains, but also by the number of specimens of known species in good preservation, with carefully recorded localities and dates, as this makes the collection important from a geographical as well as a zoological point of view. Each animal and plant has a distribution of its own, dependent, no doubt, upon some physical conditions of the Earth's surface, at present most imperfectly known to us. The study of those conditions is part of the geographer's work, and it can only be fully accomplished when the exact range and distribution of all animals and plants has been determined."

Sir Alexander Armstrong, K.C.B., F.R.S.

Sir Alexander Armstrong, born in 1818, was educated at Trinity College, Dublin, and studied medicine at the University of Edinburgh. He entered the Royal Navy as a surgeon in 1842, and saw a great deal of service in all parts of the world. At the time of his death, on July 4, he had been a Fellow of the Royal Geographical Society for forty-two years. When the expedition to search for Sir John Franklin from the Bering strait eastward was equipped in 1849, Armstrong was appointed surgeon and naturalist to H.M.S. *Investigator*, under the command of Sir Robert McClure. The incidents of this memorable voyage by which the North-West Passage was accomplished for the first and last time are too well known to require repetition. The *Investigator*, leaving her consort the *Enterprise*, pushed on eastwards along the American coast, and was finally blocked in the beginning of the second winter, September, 1851, in Mercy bay on Banks island, where the party remained two winters, until relieved on April 6, 1853,

by Lieut. Bedford Pim, of H.M.S. *Resolute*, Captain Kellett. Another winter was passed in the ice on board the *Resolute;* and finally, after four successive arctic winters, the officers and crew of the *Investigator* were transferred to the *North Star*, and returned to England in September, 1854. Sir Alexander Armstrong took special pains to preserve the crew from scurvy by the liberal administration of lime-juice, and succeeded in staving off the appearance of that disease—then an inevitable accompaniment of arctic travel—until the spring of 1852. This is said to be the longest period that a ship's company had remained free from scurvy during an arctic voyage up to that time.

The outbreak of the Russian war called Sir Alexander Armstrong to service with the Baltic fleet, when he was present at the bombardment of Sveåborg. He subsequently filled the highest offices in the naval medical services, becoming Director-General in 1869, and retiring in 1880. He received the order of K.C.B. in 1871.

In 1857 he published an account of his arctic experiences under the title of 'A Personal Narrative of the Discovery of the North-West Passage,' and in the same year he became a Fellow of the Royal Geographical Society. He was also the author of 'Observations on Naval Hygiene, particularly in connection with Polar Service.'

Franz Ritter von Hauer.

On March 20 last the death occurred of Franz Ritter von Hauer, the predecessor of von Steeb as president of the Vienna Geographical Society, and the successor of von Hochstetter as Director of the Imperial Museum of Natural History in that city. The son of a high state functionary in Vienna, where he was born, in 1822, von Hauer received his technical training at the Mining School at Schemnitz and at Eisenerz, becoming in 1846 assistant in the Museum of Mines at Vienna. He soon took a place in select scientific circles, being one of the original corresponding members of the Vienna Academy of Sciences on its foundation in 1848. After travelling at the cost of the academy through Germany, France, England, and the Austrian Crown Lands, he in 1849 took part in the foundation of the Imperial Institute of Geology, to which he was appointed consulting geologist. He likewise took an active share in the foundation of various scientific societies, more or less connected with geography, among them being the Austrian Alpine Club and the Vienna Geographical Society. Of the latter he became Vice-President in 1886, President in 1889, and Honorary President in 1897. In 1866, von Hauer succeeded Haidinger as Director of the Geological Institute, and in 1885, Director of the Natural History Museum. His special researches were not closely connected with geography, being devoted chiefly to the geological history of the Cephalopods; but his studies in this direction brought him in contact with the great Austrian geographer Simony, whose collection of fossils from the Salzkammergut supplied the materials for his first work. Of direct value to geographers was, however, his comprehensive work on the Geology of the Austro-Hungarian Monarchy, of which the first edition appeared in 1875, the second in 1878; and no less so his geological map of the monarchy in twelve sheets, which appeared during the years 1867–71. Articles also appeared from his pen of a strictly geographical nature, as, *e.g.*, that on determinations of heights in Austria and Siebenburgen, and those on the caverns of the Karst and other districts. It may also be mentioned that the introductory volume of the Crown Prince's work on the Austro-Hungarian Monarchy was from the pen of von Hauer.

CORRESPONDENCE.

Dr. Steffen's Exploration in South America.

This *Journal* published in its Monthly Record of last June (vol. xiii. p. 663) and July (vol. xiv. p. 96) some notes on Dr. Steffen's latest expedition in the west coast of Patagonia, which require some explanation.

In the first record it states, according to *Petermanns Mitteilungen*, that during his expedition Dr. Steffen noted as flowing into the "Baker channel," three large rivers, the largest of which, flowing from the east in a north-easterly direction, and "supposed to issue from a lake, probably Lake Cochrane," received the name of Rio Baker; the second, coming from the east, that of Rio Bravo; and the third one, entering the south-eastern arm of the channel, which Dr. Steffen thinks may be the lower course of the river Mayer, discovered by Mr. Hatcher, was named Rio de la Pascua.

In the July number it is stated, according to *Globus*, that Dr. Steffen has ascended the river Baker for some 45 miles, and then, leaving the main stream, which flows from the north, reached Lake Cochrane by a tributary from the north-east, and that the "river Baker is one of the largest streams of Chile, having probably the greatest volume," Lake Buenos-Aires belonging to its system.

In the course of my paper before the Royal Geographical Society on May 29, I made reference to Calen inlet, river Las Heras, river Colihue, and to Lakes Pueyrredon and Buenos-Aires; I also showed photographic slides of that inlet, the rivers, and lakes, and in the small sketch-map distributed during the lecture these names may be seen. Moreover, in the general maps presented last January to the Foreign Office by the Argentine Government to illustrate the differences existing between the Argentine and the Chilian experts on the boundary demarcation, and submitted to the arbitration of Her Majesty's Government, these and other geographical features of Patagonia are represented, while they are not on the Chilian maps. In February last I delivered to the Royal Geographical Society general and detailed maps of Patagonia, which may be used in publishing the one to illustrate my lecture, and these maps contain the same features and the names given to them.

I prepared that part of the maps from the results of the investigations of my assistants and myself during the exploration made of the eastern slope of the Cordillera of the Andes, and of some of the fjords of the western slopes in 1897 and the first months of 1898. Dr. Steffen has given the name of "Baker channel" to Calen inlet, the largest transversal fjord of Western Patagonia which figured in the map of Padre Josef Garcia, who visited its entrance in December, 1766, and was again partly explored some years ago by the Chilian steamer *Toro*, when the second and third rivers were noticed but not named, and by the Argentine steamers *Azopardo* and *Golondrina* in December, 1897, under my direction, when we discovered a large river, to which I gave the name of Las Heras (river Baker of Dr. Steffen); explored in part, river Colihue (that is to say, river Bravo of Dr. Steffen), and the river Toro (river de la Pascua of Dr. Steffen), named by me after the Chilian ship that preceded us, and which is the outlet of Lake San Martin, and not the river Mayer, which flows into the same lake. We also discovered at the same time that the inlet is divided into two parts, forming two large islands amongst other smaller ones, the first two receiving the names of *Azopardo* and *Hercules*; while another large island, somewhat further south, is named *Golondrina* island in my map. Surely Dr. Steffen saw our encampments in the inlet, in the rivers, and in Lake Pueyrredon. River Las Heras overflows from Lake Soler, which receives the waters of Lake Buenos-Aires.

The name of Lake Cochrane was given to Lake Pueyrreion by Chilian explorers posteriorly to its discovery and survey by my assistants. River Las Heras (river Baker of Dr. Steffen) is not a Chilian river in its entire extension; it cuts the Cordillera of the Andes.

I think it necessary to make these explanations to avoid confusion in the geography of Patagonia.

FRANCISCO P. MORENO.

The Ancient Ophir.

Grahamstown, Cape Colony, May 1, 1899.

I have read with much pleasure the excellent article by Dr. Schlichter on his Rhodesian explorations. As one of the old members of the Royal Geographical Society, it gives me great satisfaction to see our *Journal* the medium of conveying satisfactory information upon that difficult problem, "Where was the Ophir of King Solomon?" Under an arrangement with the B.S.A. Company and Mr. Rhodes, I proceeded to search the principal libraries of Europe in 1895, and found a key to the study of the archæology of South-Eastern Africa in the Phœnician ruins of Sardinia. My book, entitled, 'Monomotapa (Rhodesia): Its Monuments and its History, from the most Ancient Times to the Present Century,' draws exactly the same conclusions as those arrived at by Dr. Schlichter. There is only one point in which my researches force me to differ from that gentleman. There was certainly an Ophir in South-Eastern Africa, but there was also another on the Malabar coast of India. As in the northern hemisphere there were two "Tarshishes," so in the southern hemisphere there were two Ophirs. This theory reconciles seeming contradictions, and is most reasonable, as merely a rich country is signified by the name. The question is fully treated in the work just quoted, and in it is published an ancient map of South-East Africa, which the authorities of the Vatican allowed me to photograph there.

A. WILMOT.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1898-1899.

Twelfth Ordinary Meeting, June 19, 1899.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*George Beetham; W. M. Coldstream, R.E.; Cortlandt D. Godfrey; R. Gordon-Smith; W. St. C. Muscroft (1st Regiment Central India Horse); Richard Ellis Potter; William Redshaw, B.A.; Robert Taylor, M.A.*

The Paper read was:—

"Exploration between Lake Rudolf and the Nile." By Colonel J. R. L. Macdonald, R.E.

Thirteenth Ordinary Meeting, June 26, 1899.—General Sir CHARLES W. WILSON, R.E., K.C.B., K.C.M.G., Vice-President, in the Chair.

The Paper read was:—

"Road-Making and Surveying in British East Africa." By Captain G. E. Smith, R.E.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskad.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. *Sitzb. A.W. Berlin* (1899): 27–41. **Salomon.**
Neue Beobachtungen aus den Gebieten des Adamello und des St. Gotthard. Von Dr. W. Salomon. *With Sketch-maps.*

Alps—Historical. **Freshfield.**
Hannibal's Pass. By Douglas W. Freshfield. From the *Geographical Journal* for May, 1899. Size 10 × 6½, pp. 6.

Austria—Carniola. *M.k. u. k. Militär-G. I.* **18**, 1898 (1899): 64–72. **Gregor.**
Trigonometrische Höhenbestimmung des Punktes Uranschitz (Rašica) im Erdbebengebiete von Laibach. Von Julius Gregor. *With Map.*

On the resurvey of the Laibach region in order to ascertain whether the earthquake of 1895 had produced any noticeable changes; the result is to show that no such disturbance had resulted.

Austria—Salzburg. *Spelunca* **4** (1898): 107–109. **Függer.**
Le "Nixloch" du Wildmoos près Fuschl (Salzburg, Autriche). Par M. le Professeur Eb. Függer.

Austria—Speleology. *Globus* **75** (1899): 313–318, 333–335. **Crammer and Sieger.**
Untersuchungen in den Ötscherhöhlen. Von Prof. Hans Crammer u. Prof. Dr. Rob. Sieger.

On the exploration of the caves of the Oetschberg.

Austria—Styria. *Spelunca* **4** (1898): 98–106. **Héréus.**
La Caverne de Ratelstein en Styrie. Par C. G. Héréus (1720).

The description from an old manuscript of an early exploration of one of the caves of Styria.

Austria—Tirol. *Abh. G. Ges. Wien* **1** (1899): 77–89. **Damian.**
Seestudien. Lago di Serraia, Lago delle Piazze, Pragser Wildsee und Antholzer See. Von Josef Damian. *With Maps.*

Austria—Tirol. *Globus* **75** (1899): 383–384. **Jaeger.**
Das Innthal bei Kufstein und die Eiszeit. Von Julius Jaeger.

Austria-Hungary. *M. k. u. k. Militär-G. I.* **18**, 1898 (1899): 41–63. **Sterneck.**
Das neue Dreiecksnetz 1. Ordnung der österreichisch-ungarischen Monarchie. Von Robert v. Sterneck. *With Map.*

Austria-Hungary—Surveys. *M. k. u. k. Militär-G. I.* 18, 1898 (1899): 80–92. **Steeb.**
Die neueren Arbeiten der Mappierungs-Gruppe. Von Christian Ritter v. Steeb. *With Maps.*

France. **Berthaut.**
Service Géographique de l'Armée. La Carte de France, 1750–1898. Étude historique par le Colonel Berthaut. 2 vols. Paris. Imprimerie du Service Géographique, 1898-1899. Size 11 × 9, pp. (vol. i.) xviii. and 342; (vol. ii.) 586. *Maps and Plates. Presented by the French Minister of War.*

France. *Spelunca* 4 (1898): 12–17. **Galimard.**
Les Caveaux de Verpant, Commune de Flavigny (Côte d'Or). Résultat des fouilles. Par M. Joseph Galimard. *With Illustrations.*

France. *Tijds. K. Ned. Aard. Genoots. Amsterdam* 16 (1899): 37–42. **Kuyper.**
Frankrijk en zijne landschappen. Door J. Kuyper.

A table giving the old provinces of France in alphabetic order, with the capital, the departments into which they are now divided and their capitals, and the natural districts, the names of which very frequently are expressive of geographical characteristics.

France. *B.S.G. Genève* 38 (1899): 25–39. **Lugeon.**
L'origine du Chablais. Par M. Maurice Lugeon.

On the geological structure of the Alps in the Chablais, the summary of a comprehensive research.

France. *Spelunca* 4 (1898): 24–31. **Marcelin.**
La grotte de Magagnosc (Alpes Maritimes). Par M. Chiris Marcelin. *With Plan and Illustrations.*

France—Languedoc. *B.S. Languedoc G.* 21 (1898): 435–458. **Fondouce.**
Contribution à une faune historique du Bas Languedoc. Par Cazalis de Fondouce.

France—Lunéville. *B. Trim. S.G. de l'Est* (1898): 409–437. **Andriot.**
Répartition de la population dans l'arrondissement de Lunéville, d'après le relief, la nature du sol, les cultures, les industries. Par M. E. Andriot. *With Map.*

France—Marseilles. ———
Congrès National des Sociétés Françaises de Géographie. XIX^e, Session—1898—Marseille. Études sur Marseille et la Provence. Appendice: La Société de Géographie de Marseille (Histoire de la Société et Table du Bulletin), 1876–1898. Marseille, 1898. Size 10 × 6½, pp. 130 and 70. *Maps, Plans, and Illustrations.*

France—Mont Blanc. **Duparc and Mrazec.**
Mém. S. Phys. et d'Histoire Nat. Genève 33 (1898): 1–228.
Recherches géologiques et pétrographiques sur le massif du Mont-Blanc. Par Louis Duparc et Ludovic Mrazec. *With Plates.*

France and Italy. *B. Union G. Nord de la France* 19 (1898): 289–295. **Thury.**
Projet de jonction géodésique entre la France et l'Italie. Par Cassini de Thury, en 1776.

Germany—Baden. **Uhlig.**
Die Veränderungen der Volksdichte im nördlichen Baden 1852–1895. Von Dr. Carl Uhlig.—Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Elfter Band. Heft 4. Stuttgart: J. Engelhorn, 1899. Size 9½ × 6½, pp. 107–228. *Maps.*

On the changes in the distribution of population in Northern Baden between 1852 and 1895. A map of the density of population is given for each of the two years named, and a third map showing the relative increase or diminution of density.

Germany—Northern Plain. *Verh. Ges. Erdk. Berlin* 26 (1899): 129–139. **Keilhack.**
Herr Dr. Keilhack: Thal- und Seebildung im Gebiet des Baltischen Höhenrückens. *With Map.*

On the ancient valley and lake systems of Northern Germany, and a consideration of the causes which led to their origin and extinction.

Germany—Prussia. **Zweck.**
Litauen, eine Landes- und Volkskunde. Von Dr. Albert Zweck. (Deutsches Land und Leben in Einzelschilderungen. Landschaftskunden und Städtegeschichten.

I. Landschaftskunden.) Stuttgart: Hobbing & Büchle, 1898. Size $8\frac{1}{2} \times 6$, pp. viii. and 452. *Maps and Illustrations. Price* 8*s*.

A physical and anthropogeographical description of the north-eastern portion of Prussia.

Germany—Rhine Province. *Deutsche Rundschau G.* **21** (1899): 306–309. **Mehlis.**

Glaciale Erscheinungen vom Hartgebirge. Von Prof. Dr. C. Mehlis.

Germany—Schleswig. *Petermanns M.* **45** (1899): 37–40. **Langhans.**

Deutsche und Dänen in Nordschleswig. Von Paul Langhans. *With Map.*

A study of the distribution of the German and Danish languages in Schleswig at different periods since the annexation of the province.

Greece. **Leonhard.**

Die Insel Kythera. Eine geographische Monographie. Von Dr. Richard Leonhard. —Dr. A. Petermann's Mitteilungen. Ergänzungsheft Nr. 128. Gotha: J. Perthes, 1899. Size $11 \times 7\frac{1}{2}$, pp. 48. *Map.*

Hungary. *Mém. S. Spéléologie* **3** (No. 16) (1898): 1–20. **Siegmeth.**

Notes sur les Cavernes de Hongrie. Par M. Charles Siegmeth. *With Plans and Illustrations.*

Hungary—Towns. *Abrégé B.S. Hongroise G.* **26** (1898): 42–50. **Thirring.**

Die Bevölkerungsverhältnisse der ungarischen Städte im Jahre 1777. Von Dr. Gustav Thirring.

Italian Alps—Glaciers. *Mem. S.G. Italiana* **8** (1898): 155–174. **Marson.**

Sui ghiacciai del Massiccio del M. Disgrazia o Pizzo Bello. Osservazioni del 1897. Nota del socio Prof. Luigi Marson. *With Map and Illustrations.*

Italian Alps—Glaciers. *Mem. S.G. Italiana* **8** (1898): 175–198. **Marson.**

Sui ghiacciai italiani del Bernina proprio. Prime Osservazioni del 1897. Nota del socio professore Luigi Marson. *With Map and Illustrations.*

Italian Alps—Glaciers. *Riv. G. Italiana* **6** (1899): 94–97. **Marinelli.**

Lo studio del movimento dei ghiacciai in Italia nel 1898. Rapporto annuale II. di G. Marinelli.

Italy—Meteorology. *Riv. G. Italiana* **6** (1899): 201–211. **Saija.**

Deviazioni delle medie meteorologiche mensili normali dalla corrispondente media annua in Italia. Nota di G. Saija.

Italy—Venice. *Riv. G. Italiana* **6** (1899): 98–104. **Bertolini.**

Ancora della Linea e dei Fiumi di Resorgiva in relazione alle lagune e al territorio Veneto del Prof. G. L. Bertolini.

Italy—Vesuvius. *Alpine J.* **19** (1899): 437–440. **Anderson.**

Vesuvius: a Note on the Eruption of September, 1898. By Tempest Anderson, M.D. *With Illustrations.*

Mediterranean—Crete. ———

Turkey, No. 1 (1899). Further Correspondence respecting the Affairs of Crete. London: Eyre & Spottiswoode, 1899. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. xiv. and 152. *Plan. Price* 1*s*. $5\frac{1}{2}$*d*.

Netherlands. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **16** (1899): 143–177. **Lorié.**

Het Brongas in Nederland. Door J. Lorié.

On springs of natural gas in Holland.

Netherlands—Language. **Winkel.**

Tijds. K. Ned. Aard. Genootschap **16** (1899): No. 1 Supplement, 49–124.

De Noordnederlandsche tongvallen. I. De Germaansche lange Æ of Nederlandsche lange A. Door Dr. J. te Winkel. *With Map.*

On the distribution of the pronunciation of certain vowel sounds in Holland.

Norway. *Z. Ges. Erdk. Berlin* **33** (1898): 367–392. **Magnus.**

Zur Siedelungskunde von Norwegen. Von Dr. Phil. Hagbart Magnus. *With Maps.*

Norway. *Alpine J.* **19** (1899): 414–437. **Slingsby.**

Mountaineering in Arctic Norway. By William Cecil Slingsby. *With Illustrations.*

Russia—Meteorology. ———

Observations faites à l'observatoire météorologique de l'Université Impériale de Moscou. July—December, 1896, with Annual Summary; 1897, and Annual Summary, January—November, 1898. Size 11 × 8.

Scandinavia. **Baedeker.**

Norway, Sweden, and Denmark. Handbook for Travellers. By Karl Baedeker. With 32 Maps, 21 Plans, and three small Panoramas. Seventh Edition. Leipsic: K. Baedeker, 1899. Size 6½ × 4½, pp. lxxx., 464, and 40. *Price* 10 *marks*. *Two Copies. One Presented by the Publisher, the other by Messrs. Dulau & Co.*

Southern Europe. **Nerad.**

Vztah poloostrova Apenninského ku Balkánskému po stránce geografie fysikálné. Srovnává F. Nerad. V Uh. Brodě, 1898. Size 10 × 6½, pp. 42. *Presented by the Author.*

A comparison of the physical geography of the Italian and the Balkan peninsulas.

Switzerland. *B. Union G. Nord de la France* 19 (1898): 217-226. **Maquet.**

L'Engadine, le Massif de la Bornina. Par M. Maquet.

Switzerland—People. *B.S.G. Genève* 38 (1899): 57-76. **Pitard.**

Contribution à l'ethnographie du Valais. Par M. Eugène Pitard.

Switzerland—Rainfall. *B.S.G. Genève* 38 (1899): 52-57. **Gautier.**

La pluie en Suisse et à Genève. Par M. Raoul Gautier.

Turkey. *Deutsche Rundschau G.* 21 (1899): 295-302. **Struck.**

Wodena. Von Adolf Struck. *With Illustrations.*

United Kingdom—England. *J.R. Agricultural S.* 10 (1899): 30-86. **Bear.**

Flower and Fruit Farming in England. III. Fruit Growing in the Open. By William E. Bear.

United Kingdom—Meteorology. ———

Meteorological observations at Stations of the Second Order for the year 1895. Edinburgh: Printed for Her Majesty's Stationery Office. London: Eyre & Spottiswoode, 1899. Size 12½ × 10, pp. 184. *Map. Price* 22*s.* 6*d. Presented by the Meteorological Office.*

United Kingdom—St. Kilda. **Kearton.**

With Nature and a Camera, being the Adventures and Observations of a Field Naturalist and an Animal Photographer. By Richard Kearton. Illustrated by 180 Pictures from Photographs by Cherry Kearton. London: Cassell & Co., 1898. Size 9½ × 6½, pp. xvi. and 368.

This book contains some chapters on St. Kilda.

United Kingdom—Scotland. *Geolog. Mag.* 6 (1899): 196-199. **Harker.**

Glaciated valleys in the Cuillins, Skye. By Alfred Harker.

United Kingdom—Yorkshire. *Spelunca* 4 (1898): 31-39. ———

La descente de Rowten-Pot (Yorkshire, Angleterre). *With Plans and Illustrations.*

ASIA.

Arabia. **Landberg.**

Die Expedition nach Süd-Arabien. Bericht an die kaiserliche Akademie der Wissenschaften in Wien. Von Dr. C. Graf Landberg. (2 parts.) Size 9 × 6, pp. 186. *Presented by the Author.*

Dr. Müller's description of the Austrian expedition to Southern Arabia appeared in the *Journal* for June (vol. xiii. p. 638); this is Count Landberg's report of his dealings with the native sultans and his grievances against Dr. Müller. An English translation is promised to be published in London at an early date.

Arabia—Yemen. *B.S.R.G. d'Anvers* 23 (1899): 79-97. **Charnay.**

Une excursion au Yémen. Par M. Désiré Charnay.

Armenia. *Sitz. A.W. Berlin* (1899): 116-120. **Belck and Lehmann.**

Bericht über eine Forschungsreise durch Armenien. Von W. Belck und C. F. Lehmann.

Asia—British and French Possessions. **Wagner.**

Petermanns M. 45 (1899): 147–150.

Die Grösse der britischen und französischen Besitzungen in Vorder- und Hinterindien. Von Hermann Wagner. *With Map.*

Central Asia. **Hedin.**

Durch Asiens Wüsten. Drei Jahre auf neuen Wegen in Pamir, Lop-nor, Tibet und China. Von Sven Hedin. 2 vols. Leipzig: F. A. Brockhaus, 1899. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. (vol. i.) xx. and 512; (vol. ii.) x. and 496. *Maps, Portrait, and Illustrations. Two copies, one presented by the Publisher, the other by Messrs. Methuen & Co.*

The German version of Dr. Hedin's 'Through Asia' is very handsomely printed and bound in coloured boards of a striking Oriental design. The contents are practically identical with those of the English translation of the great trans-Asian journey.

Central Asia and Tibet. **Dutreuil de Rhins.**

J.-L. Dutreuil de Rhins. Mission Scientifique dans la Haute Asie, 1890–1895. Troisième Partie. Histoire—Linguistique—Archéologie—Géographie. Par F. Grenard. Appendices scientifiques. Paris: E. Leroux, 1898. Size 11×9, pp. 404. *Illustrations. Presented by the French Minister of Public Instruction.*

India—Anthropology. *J.R. Asiatic S.* (1899): 329–356. **Hewitt.**

The Pre-Aryan Commercial Village in India and Europe. By J. F. Hewitt.

India—Historical. **Van der Kemp.**

Bijd. Taal-, Land-en Volkenk. Ned. Indië 6 (1899): 247–283.

De teruggave der Nederlandsche factorijen in Hindostan Krachtens het Londensch tractaat van 13 Augustus 1814. Door P. H. van der Kemp.

On the relinquishment of the Dutch factories in India after the Treaty of Paris.

India—Madras. ——

Report on the Administration of the Madras Presidency during the year 1897–98. Madras, 1898. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. xvi. 46, 254, and ccxii. *Diagrams. Presented by the Superintendent, Government Press, Madras.*

India—North-West Provinces and Oudh. ——

Report on the Administration of the North-West Provinces and Oudh for the year ending March 31, 1898. Allahabad: 1899. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. xxxvi, 210, and 196.

India—Punjab. ——

Report on the Administration of the Punjab and its Dependencies for 1896–97; Ditto for 1897–98. Lahore, 1898–99. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. (1896–97) xii., 14, 278, and clxxxiv.; (1897–98) xiv., 14, 296, and ccxxxviii. *Maps.*

India—Punjab. *J.E. India Assoc.* 30 (1899): 30–43. **Roe.**

The Tribes and the Land of the Punjab. By Sir Charles Roe.

Indian Ocean—Seychelles. *T. Liverpool G.S.* (1898): 30–39. **Merian.**

The Seychelle Islands. By Mons. Alfred Merian.

Japan and Korea. **Lièvre**

B.S.G. Com. Havre (1897): 224–253; (1898): 1–33, 97–113, 129–165, 195–211.

Promenades japonaises et coréennes (1894–96). Par Daniel Lièvre. *With Illustrations.*

Japan—Luchu Islands. **Furness.**

Life in the Luchu islands. By Dr. William H. Furness. 3rd Author's Edition. Extracted from *Bulletin* of the Museum of Science and Art, University of Penna. No. 1. vol. ii. Philadelphia, January, 1899. Size $9\frac{1}{2} \times 6$, pp. 28. *Illustrations. Presented by the Author.*

Malay Archipelago—Amboina. **Wichmann.**

Tijds K. Ned. Aard. Genoots. Amsterdam 16 (1899): 109–142.

Der Wawani auf Amboina und seine angeblichen Ausbrüche. Von Arthur Wichmann. *With Map.*

Malay Archipelago—Java. *Meteorolog. Z.* 16 (1899): 5–21, 63–76. **Kohlbrugge.**

Meteorologische Beobachtungen zu Tosari (Java). Ein Beitrag zur Kenntniss des Höhenklimas tropischer Inseln. Von J. H. F. Kohlbrugge.

Persia. *B.S. Neuchateloise G.* 11 (1899): 27–62. **Reclus.**

La Perse. Par Élisée Reclus.

Philippine Islands. *Oester. Monats. Orient.* 25 (1899): 31–33. **Blumentritt.**
Die Filipinos als Herren im eigenen Hause. Eine ethnographisch-politische Studie von F. Blumentritt.

Philippine Islands—Ornithology. **Worcester and Bourns.**
P.U.S. National Museum 20 (1898): 549–625.
Contributions to Philippine Ornithology. Part i. A List of the Birds known to inhabit the Philippine and Palawan islands, showing their Distribution within the Limits of the two Groups. By Dean C. Worcester and Frank S. Bourns. Part ii. Notes on the Distribution of Philippine Birds. By Dean C. Worcester. *With Map and Charts.*

Russia—Caucasus. *Alpine J.* 19 (1899): 397–410. **Dent.**
The First Ascent of Tsiteli (Central Caucasus). By C. T. Dent.

Russia—Siberia. *Scottish G. Mag.* 15 (1899): 225–256. **Barrett-Hamilton.**
Kamchatka. By G. E. H. Barrett-Hamilton. *With Map and Illustrations.*

Turkey—Asia Minor. *Globus* 75 (1899): 301–305. **Chantre.**
Chantres Reisen im Antitaurus und in Cilicien. II. *With Illustrations.*

Turkey—Asia Minor. **Escherich.**
Jahresb. G. Ges. München, 1896 *u.* 1897 (1898): 99–116.
Aus Kleinasien. Von Dr. K. Escherich.

Turkey—Palestine. *Palestine Exploration Fund Q. Statement* (1899): 89–111. **Bliss.**
Second Report on the Excavations at Tell Zakarîya. By F. J. Bliss, PH.D. *With Plans and Illustrations.*

Turkey—Palestine. **Clermont-Ganneau.**
Palestine Exploration Fund Q. Statement (1899): 118–127.
A Newly Discovered Hebrew and Greek Inscription relating to the Boundary of Gezer. By Prof. C. Clermont-Ganneau, LL.D.

Turkey—Syria. *M.G. Ges. Wien* 42 (1899): 14–18. **Diener.**
Noch ein Wort über die Katastrophe von Sodom und Gomorrha. Von C. Diener.
A reply to Dr. Blankenhorn's criticisms on the author's earlier paper.

AFRICA.

Africa and Discovery. *Rev. Scientifique* 11 (1899): 545–553. **Foa.**
L'invasion européenne en Afrique. Sa marche, ses progrès, son état actuel. Par M. Edouard Foa.

Africa—Climatology. *Brit. Assoc. Rep.* (1898): 603–610. **Ravenstein.**
The Climatology of Africa.—Seventh Report of a Committee.

Africa—Railways. *Oesterreich. Monats. Orient.* 25 (1899): 51–54. ———
Die transafrikanische Eisenbahn.
On the projected "Cape to Cairo" railway.

Africa—Railway. *Deutsche Rundschau G.* 21 (1899): 402–410. **Hayek.**
Die afrikanische Transcontinentalbahn. Von Dr. G. v. Hayek.
Description of the projected "Cape to Cairo" railway, mainly translated from the *Times.*

Africa—Travel. *Mouvement G.* 16 (1899): 247–257. **Wauters.**
La Vingt-Deuxième traversée de l'Afrique Centrale de l'Atlantique au Golfe d'Aden par le commandant Marchand (août 1896—mai 1899). Par A. J. Wauters. *With Portrait and Maps.*

Algeria—Sahara. *Ann. G.* 8 (1899): 231–241. **Flamand.**
La traversée de l'Erg occidental. Grandes dunes du Sahara oranais. Par M. G.-B.-M. Flamand. *With Map.*

Algeria—Sahara. *Rev. Scientifique* 11 (1899): 651–654. **Lahache.**
L'eau dans le Sahara. Par M. Lahache.
An extract from an official report regarding the wells of the Algerian Sahara in the Wed-Mya between Biskra and Tugurt.

Congo State. *Mouvement G.* 16 (1899): 316–317. ———
Le chemin de fer des Stanley-Falls aux grands lacs. *With Map.*

Congo State **Stainier.**
État Indépendant du Congo. Annales du Musée du Congo publiées par ordre du Secrétaire d'État. Série iii.—Ethnographie et Anthropologie. L'Age de la Pierre au Congo. Par Xavier Stainier. Tome i., Fasc. i. [London: Williams & Norgate], 1899. Size 15 × 11½, pp. 24. *Plates. Presented by M. le Secrétaire de l'État Indépendant du Congo.*

On the polished and chipped stone implements of the Congo State, with coloured plates of stone spearheads, etc.

Egypt—Irrigation. ———
Public Works Ministry. Report of the Administration of the Irrigation Department for 1892, by W. E. Garstin (pp. 148); 1893 (pp. 176, size 11½ × 8½); 1894 (pp. 146); 1895 (pp. 148, size 12½ × 9); 1896 (pp. 168); 1897. Cairo: National Printing Office, 1893–1898. Size 11 × 7½, pp. 248. *Maps and Sections.*

Egypt—Nile. *Science* **9** (1899): 644–647. **Africa.**
Proposed Survey of the Nile.

Reprint of an article from *The Times* on Dr. Anderson's proposed examination of the fish fauna of the Nile.

Egypt—Nile. **Garstin.**
Nile Flood, 1892. By W. E. Garstin. Cairo, 1892. Size 13½ × 8½. *Presented by the Author.*

French Congo. *B.S.R.G. d'Anvers* **22** (1899): 279–282. **Le Roy.**
Les Pygmées—Négrilles d'Afrique. Par Mgr. Le Roy.

On the dwarf tribes of the Gabun, extracted from the complete memoir in the *Mouvement antiesclavagiste belge.*

French East Africa—Jibuti. *B.S.G. Lyon* **15** (1899): 490–502. **Charmetant.**
Un voyage à Djibouti. Par M. Charmetant.

French Sudan. *Rev. Française* **24** (1899): 129–135. **Vasco.**
Soudan Français: Le Massacre de la mission Cazemajou. Par G. Vasco.

Details of the treacherous murder of Captain Cazemajou by the Serky of Sinder, a town placed in the French sphere by the recent Anglo-French Niger Convention.

French West Africa. *B.S.G. Marseille* **22** (1898): 175–181. **Voulet.**
La France dans la Boucle du Niger et la conquête du Mossi, conférence de M. le capitaine Voulet. *With Map.*

German East Africa. **Ambronn and Grossmann.**
M. Deutsch. Schutzgeb. **12** (1899): 44–50.
Resultate aus den geographischen Ortsbestimmungen des Hauptmanns Ramsay auf der Reise nach Udjidji und an diesem Orte selbst. Januar bis Juni 1897. Bearbeitet von L. Ambronn.
Bestimmungen der geographischen Breite einer Reihe von Orten, ausgeführt von Hauptmann Ramsay auf der Tongwe-Expedition und auf einem späteren Marsche in der Zeit vom 23 August bis 13 Dez. 1897. Bearbeitet von L. Ambronn und E. Grossmann.

German South-West Africa. *M. Deutsch. Schutzgeb.* **12** (1899): 41–43. **[redacted]**
Astronomische Ortsbestimmungen in Südwest-Afrika. Ausgeführt von Hauptmann v. Estorff. Berechnet von Astronom M. Schnauder.

German South-West Africa. *Deutsche Kolonialz.* **16** (1899): 153–154, 160. **Reichenbach.**
Die Besiedelung Deutsch-Südwestafrikas. Von Dr. Ernst Stromer v. Reichenbach.

German West Africa—Kamerun. *B.S. Neuchateloise G.* **11** (1899): 109–115. **Chapuis.**
Excursion au Kamerun. Par F. Chapuis.

German West Africa—Kamerun. *M. Deutsch. Schutzgeb.* **12** (1899): **Moisel.**
Begleitworte zu der Karte des nördlichen Bulugebietes. Von Max Moisel. *With Map.*

German West Africa—Togo. *M. Deutsch. Schutzgeb.* **12** (1899): 1–37.
Ueber das Harmattanphänomen in Togo. 1. Beobachtungen über den Harmattan von Dr. H. Gruner; 2. Bemerkungen zu den meteorologischen Beobachtungen in Bismarckburg von A. Mischlich; 3. Bemerkungen zu den meteorologischen Beobachtungen in Sugu-Wangara im März 1897 von Leutnant v. Seefried; 4. Schlussbemerkung von Dr. von Danckelman.

Madagascar. *T. Liverpool G.S.* (1898): 17-30. **Colvile.**
Madagascar. By Lady Colvile.

Madagascar. *B.S.G. Com. Paris* **21** (1899): 33-40. **Conty.**
Les cultures au Brésil et l'avenir de Madagascar. Par M. A.-R. Conty.

Madagascar. *B. Trim. S.G. de l'Est* (1898): 438-469. **Courtet.**
Quelques réflexions sur l'origine des Malgaches. Par M. E. Courtet. *With Plate.*

Madagascar. *B.S.G. Com. Paris* **21** (1899): 64-79. **Durand.**
La route de Tamatave à Tananarive. Description sommaire du pays. Par M. A. Durand. *With Map.*

Madagascar. *C. Rd. S.G. Paris* (1899): 114-122. **Sibillot.**
Population du Haut-Bouéni. Par M. A. Sibillot.

Marocco. *Verh. Ges. Erdk. Berlin* **26** (1899): 204-208. **Fischer.**
Herr Prof. Dr. Th. Fischer: Ueber seine Reisen im Marokkanischen Atlas.

Sahara. *Rev. Française* 24 (1899): 94-104. **Demanche.**
Sahara: La marche de la mission Foureau-Lamy. Par G. Demanche. *With Map.*

Sahara. *C. Rd. S.G. Paris* (1899): 108-113. **Fureau-Lamy.**
Mission Foureau-Lamy.

This is the communication from M. Foureau mentioned in the *Journal* for **May** (vol. xiii. p. 533).

Sahara Railway. *B.S.G. Lyon* **15** (1899): 459-486. **Leroy-Beaulieu.**
Le Transsaharien. Par P. Leroy-Beaulieu.

South Africa. ———
South Africa. Further Correspondence relative to the Affairs of Swaziland. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. vi. and 162. *Price* 1*s.* 4*d.*

South Africa. *Verh. Ges. Erdk. Berlin* **26** (1899): 189-204. **Passarge.**
Herr Dr. S. Passarge: Reisen im Ngami-Land. *With Map.*

South-East Africa. *B.S. Neuchateloise G.* **11** (1899): 63-92. **Grandjean.**
L'Invasion des Zoulou dans le Sud-Est Africain. Une page d'histoire inédite. Par A. Grandjean.

M. Grandjean acquired his experience as a missionary in Gazaland.

Transvaal. *B. Union G. Nord de la France* **19** (1898): 206-216. **Guy.**
Le Transvaal. Par M. Camille Guy.

Tunisia. *B. Union G. Nord de la France* **19** (1898): 193-205. **Dubois.**
La Tunisie. Par M. Marcel Dubois.

West Africa. **Payeur-Didelot.**
B. Trim. S.G. de l'Est (1895): 98, 337, 563; (1896): 29, 217, 381; (1897): 177, 397; (1898): 1, 223.

Deux ans et demi au continent mystérieux. Notes et mémoires sur le Gabon—Congo et la côte occidentale d'Afrique. Par M. Payeur-Didelot.

NORTH AMERICA.

America—Bibliography. ———
American History and Geography. Books and Maps. Part i. (Books). Amsterdam: F. Muller & Co. Size 9½ × 6½, pp. 88. *Presented by the Publishers.*

Canada—British Columbia. **Brewer.**
Prospecting in British Columbia. A Paper read before the Institution of Mining Engineers. By Wm. M. Brewer. Annual General Meeting at Birmingham, September 13, 1898. Excerpt from the *Transactions of the Institution of Mining Engineers.* London and Newcastle-upon-Tyne, 1899. Size 10 × 6½, pp. 10. *Map. Presented by the Institution of Mining Engineers.*

On the Lillooet river, a tributary of the lower Fraser.

Canada—Department of the Interior. ———
Annual Report of the Department of the Interior for the year 1898. Ottawa, 1899. Size 10 × 6½, pp. xxxiv. and 470. *Illustrations.*

Canada—Ethnological Survey. *Brit. Assoc. Rep.* (1898): 696-712. ———
An Ethnological Survey of Canada.—Second Report of the Committee.

Canada—Geological Survey. ——

Geological Survey of Canada. Annual Report, vol. x Part S Section of Mineral Statistics and Mines. Annual Report for 1897. Ottawa, 1899. Size 10 × 6½, pp. 232. *Map. Presented by the Geological Survey of Canada.*

Canada—Hudson Bay. *Rep. Smithsonian I.* 1897 (1898): 359–367. **Bell.**

Rising of the Land around Hudson Bay. By Robert Bell.

Canada North-West Territory. **Macdonald.**
Blackwood's Mag. **165** (1899): 986–1002; **166** (1899): 71–87.

Pioneering in Klondike By Alexander Macdonald.

Canada Sable Island. *P and T R S. Canada* **3** (1897): 131–138. **Patterson.**

Supplementary Notes on Sable Island. By the Rev. George Patterson, D.D., etc.

Canada and Alaska. *B S G. Paris* **20** (1899). 95–132. **Lobel.**

Le Klondyke, l'Alaska, le Yukon et les îles Aléoutiennes. Par M. Loicq de Lobel. *With Map.*

Mexico *B.S G. Com. Paris* **21** (1899): 41–63. **Schœnfeld.**

Sinaloa, un des États-Unis du Mexique. Par M Schœnfeld.

North American Sea-bed. *P. and T.R S. Canada* 3 (1897): 107–116. **Bailey.**

The Bay of Fundy Trough in American Geological History. By Prof. Bailey.

St. Lawrence—Temperature *P. and T R S. Canada* **3** (1897): 17–30 **Barnes**

On some Measurements of the Temperature of the Lachine Rapids, made during the Winter of 1896–97 with a Differential Platinum Thermometer. By Howard T. Barnes.

The observations were made with a very sensitive platinum resistance electric thermometer, capable of showing differences of one-thousandth of a degree As a matter of fact, no changes more than one-hundredth of a degree from the freezing-point were detected in winter

United States. *B American G S.* **31** (1899): 118–122. **Gannett.**

The Timber Line. By Henry Gannett.

United States California *Sierra Club B* **2** (1899): 249–262. **Le Conte.**

The Basin of the South Fork of the San Joaquin River. By J. N. Le Conte. *With Plates.*

United States—Dakota *Spelunca* **4** (1898): 77–81. **Owen.**

La Caverne de Cristal (Dakota, Amerique) Par Miss Luella A. Owen. *With Illustrations*

United States Geological Survey **Walcott.**

United States Geological Survey, Fossil Medusæ. By Charles Doolittle Walcott. —Monographs of the United States Geological Survey. Vol xxx Washington, 1898 Size 12 × 9½, pp. viii. and 102. *Plates. Presented by the Survey.*

United States National Museum. ——

Annual Report of the Board of Regents of the Smithsonian Institution . . . for the year ending June 30, 1896. Report of the U S National Museum. Washington, 1898 Size 9½ × 6, pp. xxiv. and 1108 *Illustrations Presented by the Smithsonian Institution.*

United States New York. *B. American G S.* **31** (1899): 101–117 **Tarr.**

Physical Geography of New York State By Ralph S. Tarr Part vii. – The Great Lakes and Niagara. *With Maps and Illustration*

United States Pacific Slope *National G Mag.* **10** (1899): 145–159. **Gannett**

The Redwood Forest of the Pacific Coast. By Henry Gannett. *With Map and Illustrations.*

United States—Pacific Slope. *National G Mag.* **10** (1899): 160–181. **Leiberg.**

Is Climatic Aridity impending on the Pacific Slope? The testimony of the forest. By J. B Leiberg.

CENTRAL AND SOUTH AMERICA.

American Republics. ——

Commercial Directory of the American Republics, comprising the Manufacturers, Merchants, Shippers, and Banks and Bankers engaged in Foreign Trade . together

with the names of Officials, Maps, Commercial Statistics, Industrial Data, and other information concerning the countries of the International Union of American Republics, the American Colonies, and Hawaii. 2 vols. Compiled by the Bureau of American Republics, International Union of American Republics. Washington, 1897-1898. Size 12 × 9½, pp. (vol. i.) liv. and 1070; (vol. ii.) xxxviii. and 1590. *Maps. Presented by the Bureau of American Republics.*

These huge volumes form a complete directory to the republics of Central and South America, including a great deal of commercial information regarding the countries, and a list of the commercial firms and individuals arranged according to occupation.

Brazil. **Coudreau.**
Henri Coudreau. Voyage entre Tocantins et Xingú, 3 Avril 1898—3 Novembre 1898. Paris: A. Lahure, 1899. Size 11½ × 9, pp. 210. *Maps and Illustrations. Price* 6*s.* 3*d.*

This report is accompanied by a large-scale route-map of the expedition.

Brazil—São Paulo. *G.Z.* 5 (1899): 318-325. **Siemiradzki.**
Der Staat São Paulo in Brasilien und sein Landbau. Von Prof. Dr. Josef v. Siemiradzki.

Cuba. *Contemporary Rev.* 76 (1899): 118-131. **Pérez.**
The Independence of Cuba. By Antonio G. Pérez, LL.D.

Cuba. **Porter.**
Industrial Cuba. Being a Study of Present Commercial and Industrial Conditions, with suggestions as to the opportunities presented in the Island for American Capital, Enterprise, and Labour. By Robert P. Porter. New York and London: G. P. Putnam's Sons, 1899. Size 9 × 6, pp. xii. and 428. *Maps and Illustrations. Price* 15*s. Presented by the Publishers.*

The author here gives the result of an official mission of inquiry into the commercial resources and economic condition of Cuba, when the island was placed under the protection of the United States; he shows very clearly what the most urgent reforms were, and describes the remarkable results which followed in the first six months of the new administration.

Dutch Guiana. **Drimmelen—Cappelle.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 16 (1899): 1-36.
De Boven-Nickerie onderzocht en in kaart gebracht door C. van Drimmelen, Districts-Commissaris van Nickerie, en naar diens Verslag en bijeengebrachte gronden en gesteenten beschreven door Dr. H. van Cappelle. *With Map.*

The map shows some of the geological features of the valley of the Nickerie river.

Franco-Brazilian Boundary. **Benjamins.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 16 (1899): 49-50.
Het Fransch-Braziliaansch grensgeschil in verband met de grens van Nederlandsch Guiana. Door Dr. H. D. Benjamins.

French Guiana. *B.S.G. Lyon* 15 (1899): 509-522. **Brousseau.**
La Guyane Française et le Contesté Franco-Brésilien. Par M. Georges Brousseau.

French Guiana. *C. Rd. S.G. Paris* (1899): 100-101. **Brousseau.**
La Guyane Française et le Contesté Franco-Brésilien. Par M. G. Brousseau. *With Map.*

Guiana. *B. Trim. S.G. de l'Est* (1897): 423-450; (1898): 44-73, 247-269. **Pariset.**
Historique sommaire du conflit anglo-vénézuélien en Guyane. Par M. G. Pariset.

Haïti. *Petermanns M.* 45 (1899): 25-29. **Tippenhauer.**
Geologische Studien in Haïti. Von L. Gentil Tippenhauer. *With Map.*

The paper deals with the geology of the south-western peninsula of Haïti.

Paraguay. *M.G. Ges. Hamburg* 15 (1899): 24-44. **Jerrmann.**
Reise durch das Flussgebiet des Rio Ipané. Von Capt. Ludwig Jerrmann. *With Map.*

South American Tribes. *Mem. S.G. Italiana* 8 (1898): 244-294. **Boggiani.**
Guaicurú. Sul nome, posizione geografica e rapporti etnici e linguistici di alcune tribù antiche e moderne dell' America Meridionale. Memoria del Socio Guido Boggiani. *With Map.*

West Indies—Hurricane. *Quarterly J.R. Meteorolog. S.* 25 (1899): 23-32. **Carpenter.**
The West Indian Hurricane, September, 1898. By Captain A. Carpenter. *With Chart.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australasia—Bibliography. **Petherick.**
Edwards's Australasian catalogue. Catalogue of Books relating to Australasia, Malaysia, Polynesia, the Pacific Coast of America, and the South Seas. On sale at the prices affixed by Francis Edwards, 83, High Street, Marylebone, London, W. 1899. Size 9½ × 6½, pp. 220 and xxviii. *Presented by Mr. Francis Edwards.*

The separate parts of this comprehensive catalogue of books connected with Australasia have been noticed as they appeared. It is compiled by Mr. Petherick, and is of distinct bibliographical value.

Australia—Year-Book. **Greville.**
The Year-Book of Australia for 1899. Edited by the Hon. Edward Greville. London: Paul & Co. Size 9 × 6, pp. 800. *Maps and Illustrations. Presented by the Agent-General for New South Wales.*

British New Guinea. *J. R. Colonial I.* **30** (1899): 391–407. ———
British New Guinea. By Sir William MacGregor. Discussion.

British New Guinea. **Macgregor.**
British New Guinea. Annual Report for 1897–98. Colonial Reports, Annual No. 258. London: Eyre & Spottiswoode, 1899. Size 10 × 6½, pp. 84. *Price 4½d.*

British New Guinea. **Winter.**
Despatch from his Honour the Acting Administrator of British New Guinea, reporting Visit of Inspection to the Eastern and North-Eastern Districts of the Possession. [No. 5.] Brisbane, 1899. Size 13½ × 8½, pp. 4. *Presented by the Colonial Office.*

Queensland. *P. American Philosoph. S.* **37** (1898): 327–336. **Mathews.**
Divisions of Queensland Aborigines. By R. H. Mathews. *With Map.*

Queensland. **Pugh.**
Pugh's Almanac and Queensland Directory for 1899. Brisbane: Gordon & Gotch, 1899. Size 8½ × 5½, pp. 1464. *Presented by the Queensland Government.*

POLAR REGIONS.

Antarctic. *Jahresb. G. Ges. München.* 1896 *u.* 1897 (1898): 1–48. **Oberhummer.**
Die Deutsche Südpolar expedition. Von Prof. Dr. Eugen Oberhummer.

Antarctic. *Deutsche Rundschau G.* **21** (1899): 309–317. **Oppermann.**
Erklärung geographischer Namen aus der Südpolarwelt. Von Edmund Oppermann. *With Illustrations.*

Explanation and origin of the names appearing on maps of the antarctic regions.

Antarctic. *Petermanns M.* **45** (1899): 94–95. **Supan.**
Die Hauptergebnisse der deutschen Tiefsee-Expedition in den Antarktischen Gewässern. Von Prof. Dr. A. Supan.

Antarctic—Belgian Expedition. ———
Expédition Antarctique Belge. Tiré à part du Bulletin de la Société royale belge de géographie. 1899. No. 2. Size 9 × 6, pp. 14.

Arctic—Franz Josef Land. **Bruce and Clarke.**
The Mammalia and Birds of Franz Josef Land. By William S. Bruce and William Eagle Clarke. (Reprinted from the *Proceedings* of the Royal Physical Society of Edinburgh, vol. xiv.) Size 9 × 6, pp. 78–112. *Outline Map. Presented by the Authors.*

Arctic—Nansen's Journey. **Nordahl and Johansen.**
In Nacht und Eis. Die Norwegische Polar-expedition 1893–1896. Von Fridtjof Nansen. Supplement. Wir Framleute. Von Bernhard Nordahl. Nansen und ich auf 86° 14'. Von Lieutenant Hjalmar Johansen. Leipzig: F. A. Brockhaus. Size 9½ × 6½, pp. viii. and 520. *Price 10 marks. Illustrations. Presented by the Publisher.*

This volume, published as a supplement to Dr. Nansen's own account of his expedition, contains the narratives of Nordahl and of Johansen, together with numerous illustrations.

Greenland. *G.Z.* **5** (1899): 261–279. **Drygalski.**
Die Grönland-Expedition der Gesellschaft für Erdkunde in Berlin. Von E. v. Drygalski.

Greenland. *G Z.* 5 (1899): 126–141. **Richter.**
Die Grönland expedition der Gesellschaft für Erdkunde in Berlin. Von E. Richter.
Summary of Dr. Drygalski's great work on the Greenland glaciers.

MATHEMATICAL GEOGRAPHY.

Cartography—Paper. *M. k. u. k. Militär-G. I.* 18, 1898 (1899): 160–168. **Hübl.**
Beiträge zur Technik der Kartenerzeugung. Von Arthur Freiherrn von Hübl. III. Die Wahl des Druckpapieres.
On the choice of paper for printing maps, with specimens of various qualities.

Geodesy. *Vierteljahrsb. Naturforsch. Ges. Zürich* 43 (1898): 340–353. **Rudio.**
Ueber die Principien der Variationsrechnung und die geodätischen Linien des *n*-dimensionalen Rotationsellipsoides. Von Ferdinand Rudio.

Geodetic Instruments. *M. k. u. k. Militär-G. I.* 18, 1898 (1899): 73–79. **Truck.**
Der Jäderin'sche Basis—Messapparat. Mit Benützung russischer Quellen dargestellt von Sigismund Truck.
Description of Jäderin's measuring instrument for base-lines. It consists of a wire measuring-line strained to a constant tension as indicated by a dynamometer, and provided with graduated brass tubes at the ends for obtaining exact readings.

Gravity. *Abh. A. W. Berlin* (1898): 1–196. **Richarz and Krigar-Menzel.**
Bestimmung der Gravitationsconstante und der mittleren Dichtigkeit der Erde durch Wägungen. Von F. Richarz und O. Krigar-Menzel. *With plates.*

Nautical Almanac. ———
The Nautical Almanac and Astronomical Ephemeris for the year 1902. Also Part i. (containing such portions as are essential for Navigation). Published by order of the Lords Commissioners of the Admiralty, Edinburgh: Printed for Her Majesty's Stationery Office; London: Eyre & Spottiswoode. Size 9½ × 6, pp. xiv. and 638; (Part i.) xiv. and 312. *Price 2s. 6d.; Part I., 1s. Presented by the Admiralty.*

Sea-routes. *C. Rd., S.G. Paris* (1899): 105–108. **Serre.**
Comparaison des deux routes d'Europe à San Francisco par le cap Horn et par le cap de Bonne-Espérance. [Par M. Paul Serre.]
The sailing ship *Cape Clear* made the voyage from Hamburg to San Francisco last year in 152 days by the Cape of Good Hope, the favourable prevailing wind enabling it to average over 9 knots for nearly two consecutive months. Although the route is 24,296 nautical miles as compared with 14,000 miles by Cape Horn, the contrary winds on the latter passage often prolong the voyage to 150 days, and a good passage occupies 120.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Coast-forms. *J. Geology* 7 (1899): 237–246. **Jefferson.**
Beach Cusps. By Mark S. W. Jefferson. *With Illustrations.*

Earthquake Waves. **Russell.**
The Source of the Periodic Waves which are recorded from time to time on the Sydney and Newcastle Tide-Gauges. By H. C. Russell. [1898.] Size 9 × 6, pp. 6. *Presented by the Author.*

Geophysics. *Rep. Smithsonian I.* 1897 (1898): 337–357. **Kelvin.**
The Age of the Earth as an Abode fitted for Life. By the Right Hon. Lord Kelvin.

Glacier-study. *Abh. G. Ges. Wien* 1 (1899): 1–13. **Richter.**
Neue Ergebnisse und Probleme der Gletscher-Forschung. Von Dr. Eduard Richter.
This paper is the first to appear in the new large-page publication of the Vienna Geographical Society, in which original memoirs will hereafter be published, the smaller *Mitteilungen* being reserved for the proceedings of the Society, notes, bibliography, etc.

Land and Sea Hemispheres. *G.Z.* 5 (1899): 121–126. **Penck.**
Die Pole der Landoberflache. Von Albrecht Penck.

A critical examination of Dr Beythien's paper (see *Journal*, vol. xiii. p. 541), in which Prof. Penck concludes that no one point can be accepted as an exact centre of the land-hemisphere, but that two poles may be assumed one in Brittany, which brings Japan into the land hemisphere, the other in the Eastern Pyrenees, which leaves Japan in the sea-hemisphere.

Magnetic Instruments. **Palazzo.**
Atti R A. Lincei, Rendiconti 8 (1899): 386–392; 443–447.
Confronti degli strumenti magnetici italiani con quelli degli osservatori di Parc Saint-Maur e di Kew Nota di Luigi Palazzo.

Meteorology **Hepworth.**
The value of Meteorological Observations at Sea, and some hints upon observing. By M W Campbell Hepworth. Shipmasters' Society, London. [Course of Papers, No 62] London, 1899. Size 8½ × 5½, pp 85 114

Meteorology - Cyclones. *Ann Hydrographie* 27 (1899). 183 190. **Knipping.**
Ueber den Genauigkeitsgrad der Bahn-bestimmung stark ausgeprägter barometrischer Minima nach den Beobachtungen eines Schiffes in See. Von E. Knipping. *With diagrams.*

On the exact determination of the path of a cyclone from observations on board a ship at sea

Meteorology Lightning. *Sitzb. A.W. Berlin* (1899): 291–300. **Bezold.**
Ueber die Zunahme der Blitzgefahr während der letzten sechzig Jahre. Von Wilhelm von Bezold

Meteorology -Pressure. *Quarterly J.R. Meteorolog. S* 25 (1899): 32 40 **Dines.**
The Connection between the Winter Temperature and the Height of the Barometer in North-Western Europe. By W. H Dines. *With Diagrams.*

Meteorology Temperature. *Meteorolog. Z.* 16 (1899): 157 161 **Edvi.**
Die Lage der Isotherme von 0° C. Von Edm Illés v. Edvi, jun.

A mathematical investigation of the vertical distribution of temperature in the air.

Meteorology—Wind. **Dines and Wilson-Barker.**
Quarterly J.R. Meteorolog. S 25 (1899) 1-13.
Report on Experiments upon the exposure of Anemometers at different elevations. By the Wind Force Committee Drawn up by W. H Dines, B.A., and Captain D Wilson-Barker. *With Map.*

Meteorology—Wind. *Quarterly J.R Meteorolog S* 25 (1899). 13-19. **Wilson-Barker.**
Comparison of Estimated Wind-Force with that given by Instruments. By Captain D. Wilson-Barker.

Oceanographical Apparatus *Sci. P R. Dublin S.* 8 (1898). 509 514 **Joly.**
On the Geological Investigation of Submarine Rocks. By J Joly, M.A. *With Plate.*

Prof. Joly describes a form of electric drill which he has designed for the purpose of boring out cores of rock from the sea-bed at great depths. The apparatus has not been tested.

Oceanographical Apparatus. *Sci. P.R Dublin S.* 8 (1898) 753–755 **O'Toole.**
An Improved Form of Hydrometer, by which the Specific Gravity of Liquids may be accurately determined at any Temperature. By the Rev. H. O'Toole

A form of hydrometer which escapes the error due to capillarity

Oceanography. ——
Berichte der Commission fur oceanographische Forschungen Collectiv-Ausgabe aus dem LXV. Bande der Denkschriften der Kaiserlichen Akademie der Wissenschaften A. Forschungen im Rothen Meere B Forschungen im östlichen Mittelmeere. Wien, 1898. Size 12 × 9½, pp. vi and 628 *Maps and Plates.*

This collective volume contains the reports of the work done in the Red Sea in 1895–96, including gravity, magnetic, meteorological, geodetic, physical, zoological, and chemical observations and researches by various specialists. Five sections are also devoted to part of the zoological results of the cruise in the Eastern Mediterranean in 1889-94

Physical Geography. **Klein.**

Jahrbuch der Astronomie und Geophysik. Enthaltend die wichtigsten Fortschritte auf den Gebieten der Astrophysik, Meteorologie und physikalischen Erdkunde . . . herausgegeben von Dr. Hermann J. Klein. IX. Jahrgang 1898. Leipzig: E. H. Mayer, 1899. Size 9 × 6, pp. viii. and 384. *Map and Plates.*

Physical Geography. **Rouville.**

B.S. Languedoc. G. **21** (1898): 173–194, 324–342, 482–504.

Une leçon familière d'anatomie du globe terrestre. Par P. G. de Rouville.

Phyto-Geography. *G.Z.* **5** (1899): 142–162. **Karsten.**

Pflanzengeographie auf physiologischer Grundlage nach Dr. A. F. W. Schimper. Von G. Karsten. *With Illustrations.*

Terrestrial Magnetism. *Terrestrial Magnetism* **4** (1899): 33–52. **Bauer.**

The Physical Decomposition of the Earth's Permanent Magnetic Field—No. 1. The Assumed Normal Magnetization and the characteristics of the Resulting Residual Field. By L. A. Bauer. *With Diagrams.*

Terrestrial Magnetism. *Terrestrial Magnetism* **4** (1899): 53–58. **Bauer.**

Is the Principal Source of the Secular Variation of the Earth's Magnetism within or without the Earth's Crust? By L. A. Bauer. *With Diagrams.*

Terrestrial Magnetism. *Terrestrial Magnetism* **4** (1899): 7–14. **Hayford.**

Is there a 428-Day Period in Terrestrial Magnetism? By John F. Hayford.

Wind-formed Deposits. **Udden.**

Augustana Library Publications. Number 1. The Mechanical Composition of Wind Deposits. By Johan August Udden. Rock Island, I.U., 1898. Size 11 × 8, pp. 70.

A study of the forms and fineness of the particles in gravels, dune-sand, and dust deposited or transported by atmospheric action.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropology. **Giglioli.**

Due singolarissime e rare Trombe da Guerra guernite di ossa umane dell' Africa e dell' America meridionale. Nota del Prof. Enrico H. Giglioli. (Estratto dall' *Archivio per l'Antropologia e l'Etnologia*, vol. xxvi. Fasc. 2°—1896.) Size 10 × 7, pp. 8. *Presented by the Author.*

Anthropology. **Giglioli.**

La Moneta tra popoli primitivi ed il "Birok," danaro aristocratico della Nuova Irlanda. Nota di Enrico H. Giglioli. (Estratto dall' *Archivio per l'Antropologia e l'Etnologia*, vol. xxvii. Fasc. 3°—1897.) Size 10 × 7, pp. 4. *Presented by the Author.*

Commercial Geography—Maize. *J.R. Agricultural S.* **10** (1899): 116–136. **Dunham.**

Maize and its uses. By Robert W. Dunham.

On the distribution of maize as a farm crop in different countries.

Commercial Geography—Ramie. **Schulte.**

Die Ramiefaser und die wirtschaftliche Bedeutung der Ramiekultur für die deutschen Kolonien. Von A. Schulte im Hofe. Berlin: Deutscher Kolonial-Verlag (G. Meinecke), 1898. Size 9½ × 6½, pp. 50.

Commercial Geography—Shipping. **Huni.**

B.S.G. Com. Bordeaux **22** (1899): 38–42, 140–144.

Les flottes de commerce et le trafic maritime. Par A. Huni.

A comparison of the mercantile marines of different nations.

Commercial Geography—Silk. ———

Special Consular Reports. Sericulture and Silk Reeling from the Cocoons by Machinery. Cultivation of the English Walnut. Vol. xv., part ii. Washington, 1899. Size 9½ × 6, pp. 127–170. *Illustrations.*

Commercial Geography—Tropical Agriculture. **Lecomte.**

B.S.G. Com. Paris **21** (1899): 17–32.

Influence des jardins d'essai sur le développement de l'agriculture aux colonies. Par M. Henri Lecomte.

Fetishism. *B.S. Neuchateloise G.* 11 (1899): 119-136. **Perregaux.**
Le Fétichisme. Par E. Perregaux.
A study of West African fetishism by a missionary.

Historical. *B.S. Topographie France* 22 (1898): 58-62, 122-126. **Guyot.**
Table de Peutinger. Par M. le capitaine Guyot.

Historical—Ancient Globus. *B.S.G. Paris* 20 (1899): 76-94. **Marcel.**
Note sur une mission géographique en Suisse. Par Gabriel Marcel. *With Illustrations. Also separate copy. Presented by the Author.*

Historical—Cabot. *P. and T.R.S. Canada* 3 (1897): xciii.-clxxvi. ——
The Cabot Celebration at Halifax. *With Chart and Illustrations.*

Historical—Cabot. *P. and T.R.S. Canada* 3 (1897): 279-307. **Thacher.**
The Cabotian Discovery. By J. B. Thacher.

Historical—Cabot. *P. and T.R.S. Canada* 3 (1897, Sect II.): 139-268. **Dawson.**
The Voyages of the Cabots. Latest Phases of the Controversy. By Samuel Edward Dawson, LIT. D. (Laval). *Maps.*

Historical—Gilbert. *P. and T.R.S. Canada* 3 (1897): 113-127. **Patterson.**
Termination of Sir Humphrey Gilbert's Expedition. By the Rev. George Patterson, D.D., etc. *With Maps and Illustrations.*
Discusses the probable position of the shipwreck of the *Squirrel* with Sir Humphrey Gilbert on board in 1583, and comes to the conclusion that it was off Louisbourg harbour, and not on Sable island.

Historical—Maps. *Z. Ges. Erdk. Berlin* 33 (1898): 400-417. **Kretschmer.**
Nordenskiöld's Periplus. Von K. Kretschmer.

Historical—Marco Polo. *M.G. Ges. Hamburg* 15 (1899): 45-65. **Schäfer.**
Zur Erinnerung an Marco Polo. Von Dr. Ernst Schäfer.

Historical—Vasco da Gama. *B.S.R.G. d'Anvers* 22 (1899): 207-328. **Ceulemans.**
Les découvertes maritimes des Portugais et le premier voyage de Vasco da Gama aux Indes. Par M. E. Ceulemans.

Historical—Vasco da Gama. **Hümmerich.**
Jahresb. G. Ges. München, 1896 *u.* 1897 (1898): 49-75.
Vasco da Gama. Von Dr. Franz Hümmerich.

Historical Geography. *Mem. S.G. Italiana* 8 (1898): 224-243. **Ricchieri.**
Di alcuni studi di storia della Geografia antica. Nota del socio Prof. Giuseppe Ricchieri.
Discussion of a number of works on the geographical knowledge of the Greeks.

BIOGRAPHY.

Hauer. *Abh. G. Ges. Wien* 1 (1899): 91-118. **Böhm.**
Zur Erinnerung an Franz von Hauer. Von Dr. August Böhm Edlen von Böhmersheim.

Kiepert. *Globus* 75 (1899): 297-301. ——
Selbstbiographie von Heinrich Kiepert, † 21 April, 1899.
This portion of autobiography was written in 1873 for Dr. Richard Andree. The first page is here given in facsimile of the author's handwriting.

Michelet. *B.S. Topographie France* 22 (1898): 130-134. **Drapeyron.**
Comment Michelet est devenu historien et géographe. Par M. L. Drapeyron.

Partsch. *Deutsche Rundschau G.* 21 (1899): 326-328. ——
Josef Partsch. *With Portrait.*

Patterson. *P. and T. Nova Scotian I. Sci.* 9 (1898): xcv.-xcviii. **Gilpin.**
Obituary Notice of the late Rev. G. Patterson, D.D., LL.D. *With Portrait.*

Péchy. *Abrégé B.S. Hongroise G.* 26 (1898): 1-3. **Homolka.**
Emerich v. Péchy. Von Josef Homolka.
Emerich von Péchy was a Hungarian cartographer, born September 25, 1832, died February 19, 1898.

Pomba. *Deutsche Rundschau G.* 21 (1899): 423–425. ———
Cesare Pomba. *With Portrait.*

Schoeller. *Deutsche Rundschau G.* 21 (1899): 421–423. **Paulitschke.**
Dr. Max Schoeller. Von Ph. Paulitschke. *With Portrait.*

GENERAL.

Africa—Health. **Crosse.**
Blackwater Fever. By W. H. Crosse. Reprinted from the *Lancet*, March 25 and April 1, 1899. Size 7 × 5, pp. 23. *Presented by the Author.*

Bibliography. **Newman.**
University of the State of New York. State Library Bulletin, Bibliography No. 14. August, 1898. Index to Subject Bibliographies in Library Bulletins to December 31, 1897. By Alice Newman. Albany, 1898. Size 10 × 7, pp. 369–426.

Bibliography—Library Catalogue. **Grulich.**
Katalog der Bibliothek der Kaiserlichen Leopoldinisch-Carolinischen Deutschen Akademie der Naturforscher. Bearbeitet von Oscar Grulich. Zweiter Band. Halle, 1893-98. Size 10 × 6½, pp. l. and 1027–1436. *Presented by the Academy.*

A classified subject catalogue, with alphabetical index, now completed.

British Colonies. **Chevilliard.**
Les Colonies Anglaises. Par G. Chevilliard. Paris: A. Challamel, 1899. Size 10 × 6½, pp. 416. *Presented by the Author.*

An account of the British empire from the administrative point of view, laying stress on the difference in the political organization of the various dependencies according to the peculiarities of population and productions.

British Colonies. *J.R. Colonial I.* 30 (1899): 477–520. **Robinson.**
The Colonies and the Century. By Hon. Sir John Robinson, K.C.M.G.

British Empire. ———
The Queen's Empire. A Pictorial and Descriptive Record. Illustrated from Photographs. 2 vols. London: Cassell & Co., 1897–1899. Size 9½ × 12½, pp. (vol. i.) xx. and 288; (vol. ii.) xii. and 288. *Map. Presented by the Publishers.*

A collection of photographs illustrating life in all parts of the British Empire, especially with reference to defence, administration, religion, and sports.

Educational—Pictures. **Dubois and Guy.**
Album Géographique. Par MM. Marcel Dubois et Camille Guy. Tome III. Les régions tempérées. Paris: A. Colin & Cie, 1899. Size 11½ × 9, pp. xx. and 244. *Illustrations. Price* 13*s.* 6*d.*

Educational—Pictures. **Zimmerer**
Jahresb. G. Ges. München, 1896 *u.* 1897 (1898): 89–98.
Der Photocol-Sammel-Atlas, eine neue Methode des geographischen Anschauungs-Unterrichtes. Von Dr. H. Zimmerer.

Describes Herr Rudolph Mayer's system of coloured photographs of places arranged for education. The method will soon be exemplified in an English edition.

Egyptian Geographical Museum. **Bonola.**
Société Khédiviale de Géographie. Le Musée de Géographie et d'Ethnographie. Notice par le Dr. Frédéric Bonola Bey. Le Caire, 1899. Size 10 × 6½, pp. 30. *Illustrations. Presented by the Société Khédiviale de Géographie.*

Describes the museum of the Khedivial Geographical Society recently opened at Cairo.

Geographical Orthography. **Garnier.**
Méthode de Transcription Rationnelle générale des noms géographiques s'appliquant à toutes les écritures usitées dans le monde. Par Christian Garnier. Paris: E. Leroux, 1899. Size 13 × 10, pp. xii. and 148. *Presented by the Publisher.*

The late M. Garnier devoted much attention to the question of orthography. The transliteration of oriental and slavonic alphabets is here considered in great detail, as well as the phonetic rendering of languages which possess no alphabet.

Geographical Progress. *B.S.G. Paris* **20** (1899): 5–75. **Hulot.**
Rapport sur les progrès de la géographie pendant l'année 1898. Par le baron Hulot. *With Maps.*

Geographical Year-Book. **Wagner.**
Geographisches Jahrbuch. XXI. Band, 1898 . . . herausgegeben von Hermann Wagner. Gotha: Justus Perthes, 1899. Size 8½ × 6, pp. viii. and 500.

This volume contains a statement of the progress of polar research by Dr. Drygalski, of the study of the countries of Europe (except the United Kingdom, Austria-Hungary, and Russia) by Prof. Fischer, of ethnology by Prof. Gerland, and of geographical meteorology by Prof. Brückner.

Geographical Year-Book. **Wagner.**
Geographisches Jahrbuch. XXII. Band, 1899 . . . herausgegeben von Hermann Wagner. Erste Hälfte. Gotha: Justus Perthes, 1899. Size 8½ × 6, pp. 244.

This issue includes a report on the progress of Oceanography in 1897 and 1898, by Prof. Krümmel; a report on the progress of surveying and the astronomical fixing of position, by Dr. Hammers; an account of recent advances in the geological structure of different regions, by Prof. Toula; and a report on recent works respecting the geography of the ancients, by Prof. Eugen Oberhummer.

Geography. *B. American G.S.* **31** (1899): 123–149. **Littlehales.**
The Navy as a Motor in Geographical and Commercial Progress. By G. W. Littlehales. *With Maps.*

Italian Geographers. *Mem. S.G. Italiana* **8** (1898): 295–337. **Bertacchi.**
Geografi italiani all' estero. Memoria del Socio prof. Cosimo Bertacchi.

On the work of Italians in geography in all parts of the world.

List of Maps. **Knox.**
A Guide to Recent Large-scale Maps, including both Surveys and Compilations; together with a list of some large Sheet Atlases, forming a Supplement to 'Notes on the Government Surveys of the Principal Countries of the World' (1882). Prepared in the Intelligence Division, War Office, by Alexander Knox, B.A., Map Curator. London: Eyre & Spottiswoode, 1899. Size 10 × 6½, pp. viii. and 182. *Price 5s. 6d. Presented by the War Office.*

This list gives the name of the map, the scale, date, publisher, and general remarks, including size of sheet and price. It is arranged, for the most part, alphabetically in countries, under the head of each continent.

Moravian Missions. ———
Periodical Accounts relating to the Foreign Missions of the Church of the United Brethren ("Moravians"). Second Century. Volume iv. London, 1899. Size 8½ × 5½, pp. 60 and xxviii.

Portuguese Colonies. *B.S.G. Marseille* **22** (1898): 117–142. **Barré.**
Les Colonies Portugaises. Par M. Henri Barré.

A summary based on Captain Vasconcello's book on the Portuguese colonies.

Street Traffic. *J. Franklin I.* **147** (1899): 315–327, 344–359. **Higgins.**
Some of the Larger Transportation Problems in Cities. By Edward E. Higgins.

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**
Publications issued since June 8, 1899.

1-inch—General Maps:—

ENGLAND AND WALES:—106, 113, 126, 138, 139, 143, 153, 154, 155, 156, 167 (revision), engraved in outline, 1*s. each.*; 92, 94, 206, 251 (revision), hills engraved in black or brown, 1*s. each.*

6-inch—County Maps:—

ENGLAND AND WALES (revision):—**Derbyshire**, 18 N.W., 19 S.W., 25 N.E., 26 N.W., S.W. **Durham**, 15 S.W., 50 S.E., 51 S.W., 57 N.W. **Herts.**, 3 N.E., S.E., 4 S.W., S.E., 5

S.W., 7 N.W., N.E., S.W., S.E., 9 N.E., 11 N.E., 12 N.W., N.E., 13 N.W., N.E., 14 N.W., 22 N.W., N.E., S.W., 23 S.W., S.E., 29 S.W., S.E., 30 N.E., S.E., 33 N.W., 43 N.E. **Northumberland**, 4 N.W., 5 N.E., 12 S.W., 23 N.E., 57 S.E., 106B N.E. **Sussex**, 33 N.E., S.W., 60 complete, 61 N.W., N.E., S.E., 62 complete, 63 complete, 64 N.W., N.E., S.W., 65 complete, 66 complete, 72 N.W., N.E., 73 N.W., N.E., S.E., 74 N.W., N.E., 75 N.W., N.E., 77 N.E., 81 N.E. 1*s. each.*

25-inch - Parish Maps:—

ENGLAND AND WALES (revision):—**Berkshire**, VII. 6, 9; VIII. 9; X. 1, 7, 10, 11, 12, 13, 14, 16; XI. 9, 13; XXIV. 15; XXXI. 9; XXXII. 10; XXXVIII. 2, 3, 11; XXXIX. 6, 7, 8, 9, 10, 11, 12, 13; XL. 2, 10; LXVII. 1, 2, 3, 6. **Bucks.**, LII. 15; LIV. 5, 9; LVI. 2, 10; LVIII. 2, 7. **Cumberland**, XXXIV. 6; XLII. 2, 10, 11; LXIII. 13; LXIV. 13, 14; LXV. 15; LXXII. 8. **Derbyshire**, XXXI. 13. **Denbighshire**, IX. 2; XX. 7, 15, 16; XXI. 11, 12; XXII. 5, 6; XXIX. 3. **Flint**, II. 2, 6, 10, 11, 12, 14; III. 13; V. 3, 7, 12, 14, 16; VI. 5; VIII. 2, 6, 12; IX. 1, 2, 6, 7, 10, 15; XI. 9, XIII. 1, 4, 5, 7; XIV. 1, 3, 14; XV. 1; XVI. 4, 7, 15, 16; XVII. 10, 11, 12; XXII. 5, 8; XXIII. 5. **Glamorganshire**, IV. 15; X. 2; XXIV. 8; XXV. 1, 5, 8, 11, 12, 16; XXVI. 1, 5, 9, 11, 15; XXXIV. 2, 5, 6; XXXIX. 16; XLIV. 15; XLVIII. 4, 8. **Nottinghamshire**, I. 12, 16; III. 4, 8, 15; IV. 1, 5, 11, 13, 14, 15; V. 4; VI. 1; XXII. 13; XXVII. 2. **Oxfordshire**, XXV. 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; XXX. 4, 6, 10, 14; XXXI. 4, 7, 12; XXXIV. 6; XXXVI. 6, 8, 10, 15; XL. 2; XLV. 7, 8, 10, 11, 12, 14, 16; XLVI. 9, 13. **Staffordshire**, IV. 2; VII. 11; VIII. 14, 15, 16; XIII. 1, 2, 3, 6, 7, 8, 11; XIV. 1. **Sussex**, XXVII. 2, 5, 6, 9, 10, 13, 14; XL. 1, 2; LIV. 2, 5, 6, 9, 10; LV. 9, 14; LVI. 13; LVII. 12, 16; LVIII. 6; LXVII. 1, 2, 3, 4, 6, 8, 9, 10, 12, 13, 15; LXVIII. 3, 4, 5, 8, 10, 12, 13; LXIX. 13; LXX. 4; LXXIX. 3, 8, 12; LXXX. 1. 3*s. each.*

ENGLAND AND WALES (revised), printed in colours and folded in case, 202, 203, 208, 219, 220, 221, 222, 223, 236, 237, 238, 239, 240, 241, 242, 252, 253, 254, 255, 256, 257, 258, 265, 266, 267, 268, 269, 270, 271, 281, 283, 284, 285, 286, 287, 288, 297, 299, 300, 301, 302, 303, 304, 311, 312, 313, 314, 315, 316. *Price* 1*s. each.* Also published unfolded with a few exceptions.

(*E. Stanford, Agent.*)

England and Wales. **Bartholomew.**

Reduced Ordnance Survey of England and Wales. Scale 1 : 126,720 or 2 stat. miles to an inch. Sheet 2, South Northumberland. J. Bartholomew & Co., Edinburgh, 1899. *Price* 2*s.* mounted on cloth. *Presented by the Publishers.*

Germany. **Topogr. Bureau des K. Bayer. General-Stabes.**

Karte des Deutschen Reiches. Herausgegeben vom topogr. Bureau des K. Bayer. General-Stabes, 1899. Sheet 673, Vereinsalpe. Scale 1 : 100,000 or 1·6 stat. mile to an inch. *Price* 1.50 *marks.*

ASIA.

Central Asia. **Grenard.**

Mission Scientifique dans la Haute-Asie. Carte de l'Asie Centrale, dressée d'après les travaux des explorateurs modernes les cartes chinoises et les renseignements d'indigènes par F. Grenard, dessinée par J. Hansen, 1899. Publication du Ministère de l'Instruction Publique Paris. Scale 1 : 4,000,000 or 63 stat. miles to an inch. Ernest Leroux, Paris.

This map is without hill-shading, but is to a certain extent orographically coloured, the mountain regions being tinted brown, and the crests of the ranges being indicated by brown lines of different breadths, according to their relative importance. The routes of explorers are shown, though somewhat indistinctly. The capitals of provinces, prefectures, travellers' rest-houses, and post stations are distinguished by the different symbols employed, and other useful information is given.

Central Asia. **Grenard.**

Carte Ethnographique et Politique de l'Asie Centrale par F. Grenard, 1899. Supplément á l'Atlas de la Mission Dutreuil de Rhins. Scale 1 : 9,000,000 or 142 stat. miles to an inch. Ernest Leroux, Paris.

This map is published as a supplement to the atlas of the Mission of Dutreuil de Rhins in Central Asia. In addition to the ethnographical colouring, commercial routes, both modern and ancient, are laid down.

Japan. **The Welcome Society of Japan.**

Map of Japan for tourists. Published by the Welcome Society of Japan, Tokyo.

Philippine Islands. **U.S. War Department.**

(1) Carta General del Archipiélago Filipino. Scale 1 : 1,400,000 or 22·1 stat.

miles to an inch. Chofré y Compa., Manila, 1897. Reproduced under the direction of Brigadier-General A. W. Greely, for use of the Signal Corps, U.S.A., 1899.
(2) Map of Manila and vicinity, showing positions of troops prior to the battle of February 5, 1898, and location of the military telegraph lines then in operation; also positions and locations after the capture of Caloocan, February 10. Scale 1 : 25,000 or 0·4 stat. mile to an inch. Prepared under the direction of Lieut.-Colonel R. E. Thompson, by J. H. Watkins, Sergt. Vol. Signal Corps, Manila. 1899.

(3) Map of the operations against Manila, 1898. Compiled and drawn under supervision of Lieut.-Colonel R. E. Thompson, C.S.O., by J. H. Watkins, Sergt. Vol. Signal Corps. Scale: 0·18 stat. mile to an inch. Office of Chief Signal Officer. Dept. of Pacific and 8th A.C. *Presented by Brigadier-General A. W. Greely.*

The maps have been published under the direction of Brigadier-General A. W. Greely, Chief Signal Officer U.S. Army, for the use of the United States officers employed in Philippine campaign.

AMERICA.

Cuba. **U.S. War Department.**
Military Telegraph Lines operated by the Signal Corps, U.S. Army in Cuba. Scale 1 : 300,000 or 4·7 stat. miles to an inch. Prepared under the direction of Brigadier-General A. W. Greely, Chief Signal Officer U.S. Army, by Colonel H. H. C. Dunwoody, 1899. Washington, D.C. 2 sheets. *Presented by Brigadier-General A. W. Greely.*

Cuba. ———
Map of Cuba, showing telegraph lines. A. B. Graham, Photo. Lith., Washington, D.C.

Puerto Rico. **U.S. War Department.**
Military Map of the Island of Puerto Rico, 1898. Scale 1 : 253,440 or 4 stat. miles to an inch. Drawn by W. Morey, Jr., C.E. Adjutant-General's Office, Military Information Division, Washington, D.C. *Presented by Lieut. Grant Squires.*

GENERAL.

World. **Meyer.**
Meyer's Hand-Atlas. Zweite, neubearbeitete und vermehrte Auflage mit 112 Kartenblättern, 9 Textbeilagen und Register aller auf den Karten verzeichneten Namen. Parts 2 to 14. Leipzig und Wien. Verlag des Bibliographischen Instituts, 1899. *Price* 30 *pf. each part.*

World. **Vivien de Saint Martin and Schrader.**
Atlas Universel de Géographie. Ouvrage commencé par M. Vivien de Saint Martin et continué par Fr. Schrader. Paris: Librarie Hachette et Cie. Sheet: Amérique du Nord. Physique. *Price* 2 *fr.*

This sheet is orographically coloured in five tints, showing elevations from sea-level to above 2000 metres. The depths of the ocean are shown in different shades of blue, at intervals of 1000 metres; soundings in the deeper basins are also given in figures. The latest reliable material has evidently been used in the compilation of this map, and the style in which it is drawn leaves nothing to be desired.

CHARTS.

United States Charts. **U.S. Hydrographic Office.**
Pilot Chart of the North Atlantic and Pacific Oceans for July, 1899. Published at the Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Morocco. **Smith.**
Twenty Photographs of Morocco, taken by W. W. Hind Smith, Esq. *Presented by W. W. Hind Smith, Esq.*

This series of photographs appears to have been taken with a small hand-camera. The subjects are well chosen, and as they are remarkably clear, they would well bear enlargement. The following is a list of the titles :—

(1) A Moor of Tangier; (2) Moorish country house; (3) Women carrying wood; (4) A saint's tomb; (5) Patron saint's tomb, Tetuan; (6) Market-place, Tetuan; (7) Market scene at Tetuan; (8) Spaniards firing at effigy of Judas in Tetuan at Easter;

(9) Interior of Moorish room, Tetuan; (10) Entrance to mosque, Tetuan; (11) Street scene, Tetuan; (12) Grain market, Tetuan; (13) Moorish house and garden, Tetuan; (14) Tetuan, looking towards the Kasbah; (15) Moorish village girl; (16) Boys at a camp; (17) Camp at Harraiish; (18) Tangier Sôko (market); (19) Mode of travel; (20) El Jezeed and boy.

Venezuela. **Paterson.**

Forty-five Photographs of Venezuela, taken by Major Stanley Paterson. *Presented by Major Stanley Paterson.*

This is a series of views taken by Major Stanley Paterson on the Orinoco river, the titles of which are given in the following list:—

(1) View in the delta: Guaraunos canoe; (2) View in the delta: Guaraunos canoe; (3) View in the delta, Guaraunos canoe; (4) Guaraunos village, delta of the Orinoco; (5) Barrancas; (6) Government House, Ciudad Bolivar, residence of the President of the State of Guayana; (7) Venezuelan officers, Ciudad Bolivar; (8) The President's guard, Bolivar; (9) President's guard, Bolivar; (10) Barrack guard, Bolivar; (11) Urbana, Rio Orinoco; (12) Rio Orinoco near Carriben: Venezuelan canal; (13) View of the banks of the Orinoco near Urbana, showing gradual detrition; (14) Rock at Castillito, Rio Orinoco; (15) Mogoti rock, Rio Orinoco, between Urbana and Carriben; (16) Mouth of the Cabulliane; (17) Perico; (18) The Orinoco at Salvajito; (19) The forest on fire, La Garcita between Salvajito and Maipures; (20) Randal de Guahibos; (21) Randal de Guahibos; (22) Portage of a "piragua" over the Randal de Guahibos; (23) View on the Tuparro river; (24) The steamer *Meta* on the rocks near the mouth of the Tuparro river; (25) The Orinoco at Maipures; (26) Cerromono between Maipures and Mundrapo; (27) View near the mouth of the Sipapo river, showing part of the sacred mountain of the Piaroas Indians, Mount Sipapo; (28) Piaroas Indians in canoes near the mouth of the Sipapo river; (29) My "bonga," or dug-out: a rest for food; (30) Mouth of the Rio Vichada; (31) A Venezuelan house at Mundrapo; (32) Piaroas Indian women (civilized), Mundrapo, Rio Orinoco; (33) A rock between Mundrapo and San Fernando, showing the high-water mark; (34) Indians preparing rubber, Nericagua, Rio Orinoco; (35) A half-caste "gommero," or rubber-gather, and family, Guaniana, Rio Guaviaro; (36) Gommeros "barraca," or hut, Guanayana; (37) San Fernando from the Atabapo; (38) San Fernando de Atabapo: river front; (39) A lane in San Fernando de Atabapo; (40) "Pia pora" (the Toucan), my Guanibo Indian boy, San Fernando de Atabapo; (41) Venezuelans and Guahibos at San Fernando de Atabapo; (42) Junction of the Atabapo and Guaviare rivers near San Fernando de Atabapo; (43) Indians carrying manioc, Rio Atabapo; (44) Indian hut, Marocoti, near San Fernando de Atabapo; (45) Enormous Cerba tree near Morocoti, Rio Guaviare.

West Africa. **Johnston.**

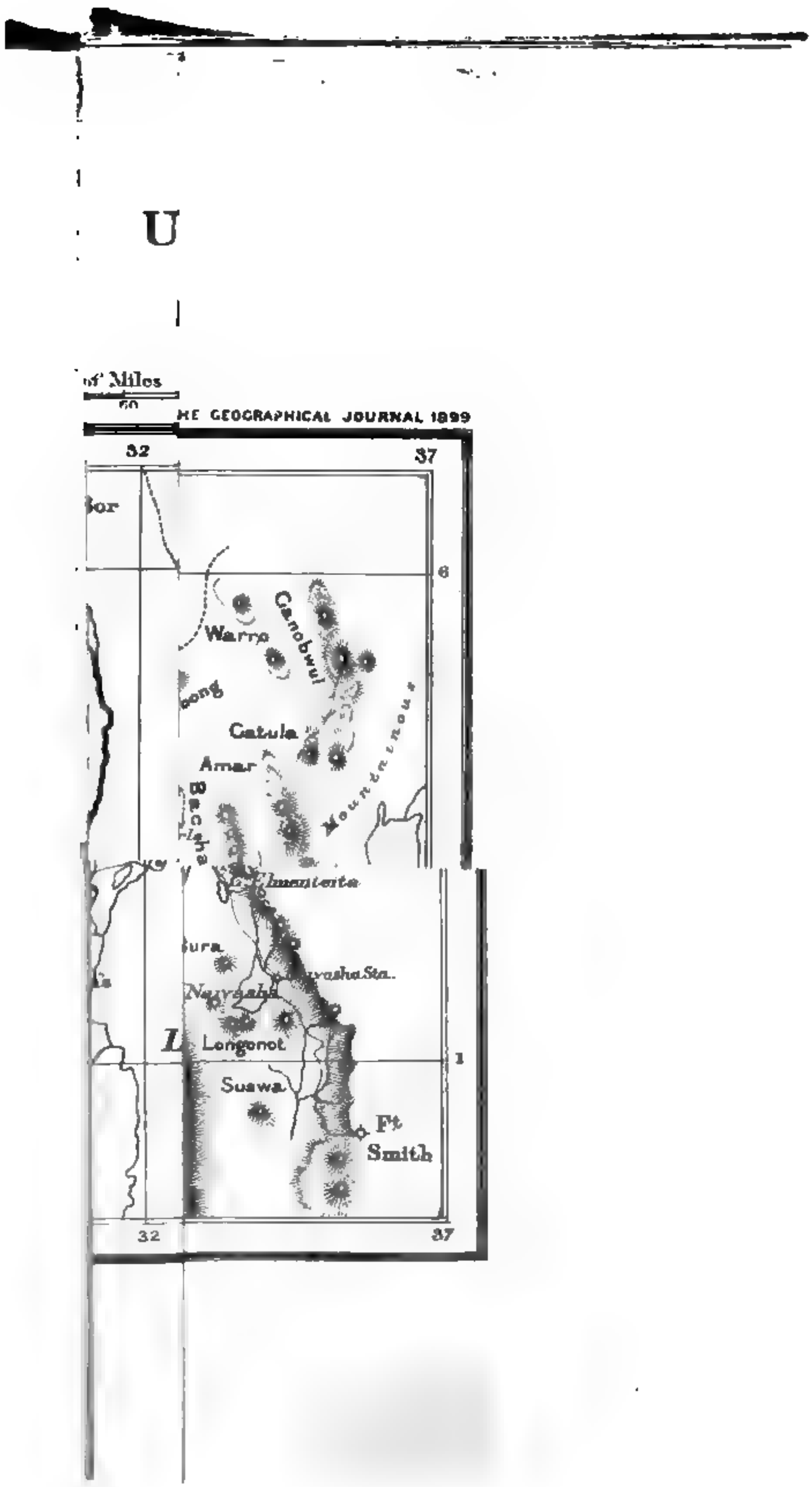
Sixteen Photographs of Sierra Leone and the Gold Coast, taken by W. S. Johnston, Esq. *Presented by Rev. F. G. Snelson, M.A., Ph.D.*

These photographs illustrate the scenery of the west coast of Africa in the Sierra Leone and Gold Coast colonies, in addition to which there are some groups of natives. The titles are given below.

(1) The reservoir inside the Victoria Park, Freetown, Sierra Leone; (2) Native artillery, Freetown; (3) The procession to the court house after the assize service (Judge Bruce Hindle), Freetown, 1896; (4) Princess Christian Cottage Hospital (back view), Freetown; (5) Kru Town road, Freetown; (6) Congo Town, Sierra Leone; (7) Cape Sierra Leone and the lighthouse; (8) The fort, Chama, Gold Coast; (9) Tarkwa village (gold-mining district), Gold Coast; (10) Axim, Gold Coast; (11) St. George's castle, Elmina, Gold Coast; (12) Cape Coast Castle, Gold Coast; (13) Chief Coker, Cape Coast; (14) Fort William lighthouse, Cape Coast; (15) Bonthe, Sherboro; (16) no title.

PHOTOGRAPHS.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.


U
of Miles
60
HE GEOGRAPHICAL JOURNAL 1899
32
37
Bor
6
Warro
Ganobwul
bong
Gatula
Amar
Bacha
Mountainous
Ilmanteita
Sura
NavashaSta.
Navasha
Longonot
L
1
Suawa
Ft
Smith
32
37

The Geographical Journal.

No. 3. SEPTEMBER, 1899. Vol. XIV.

EXPLORATIONS IN PATAGONIA.*

By Dr. FRANCISCO P. MORENO.

I.

Our President lately recalled the fact that vast areas existed in South America still unknown to geography, which were not only interesting on account of the rich products they may be presumed to contain, but also for the variety, beauty, and charm of their landscapes. This certainly referred, amongst other regions, to certain parts of the Argentine Republic, and particularly to Patagonia.

As a matter of fact, up to quite recent times, the geography of the southern portion of the New World has been in a very backward state. Since the memorable hydrographical expeditions of the *Adventure* and the *Beagle*, supplemented later on by those of the *Nassau* and the *Maine*, we can only remember the Chilian investigations in Chiloe and Guaitecas and on the western coast of Patagonia. With reference to the interior of the latter country south of parallel 40°, the little that was known up to 1870 was derived from Argentine or Chilian surveys of very limited areas, and since the discovery of the Chubut river by the *Beagle* expedition, and the exploration of the river Santa Cruz, in which Charles Darwin took part, the maps of Patagonia have presented no new feature; its fluvial system was taken from the ancient Spanish charts, and of its numerous lakes only some three or four were indicated, and even then their exact position remained undecided.

It was not until 1869-70 that George Chaworth Musters crossed Patagonia from end to end for the first time, in the company of some Tehuelchian Indians, on one of their periodical migrations; but,

* Read in part at the Royal Geographical Society, May 29, 1899. Map, p. 352. A map on a much larger scale will be published in a future number.

unfortunately, owing to the mode of life he had to follow, and the route chosen by the Indians—the easiest and the one most abounding with game, but still the least interesting one—his narrative, although it constitutes a picture full of life and interest, by the description of the customs of his fellow-travellers and of the general aspect of the landscape, contains little of a concrete or new character from a purely geographical standpoint. It may, therefore, be affirmed that the detailed survey of the Patagonian territory first became of importance when the agitation commenced with respect to the boundary question between the Argentine Republic and Chile.

Both countries claimed, as a heritage from Spain, the austral region, and if both parties were in possession of documents, more or less authentic, which support their arguments as to the respective jurisdictions prior to the emancipation from the mother country over the territory in dispute, little or nothing had been done by them to determine its nature. The Argentine Republic considered as belonging to her the territories to the east of the crest of the Andean mountain range, or the "Cordillera Nevada" of the *conquistadores* and the Spanish historians—a formidable barrier and boundary imposed by nature herself; whilst Chile maintained that her territory included Patagonia as far as the Atlantic coast, and proposed to colonize the territory situated east of the Cordillera, which Captain Simpson, of the Chilian navy, had traversed, in 1873, from side to side, following the course of the Aisen river until he saw it descend from the eastern plains. The Argentine Republic possessed settlements in Rio Negro, Chubut, Santa Cruz, and Staten island, whereas Chile had founded Punta Arenas in the Straits of Magellan, but the interior of the country remained an enigma, which commenced to be solved in 1872, when an Argentine naval officer, Mr. Feilberg, ascended for the second time, forty years after Fitzroy, the river Santa Cruz, and proceeded as far as a lake which he believed to be the one discovered by Viedma, in 1782.

It was in 1873, when I made my first excursion to Patagonia, that I visited the Rio Negro. The year following, I returned to the same places, and went as far as Santa Cruz. In 1875 I crossed from Buenos Aires to Lake Nahuel-Huapi and the Andean Cordillera, between parallels 39° 30′ and 42°. In 1876 I visited Chubut, and ascended the river Santa Cruz, recognizing that the lake found by Feilberg was not the one Viedma discovered, and that these lakes, with many others, formed a vast system situated in a longitudinal depression parallel with the Cordillera. In the tract of land between Santa Cruz and the Straits of Magellan, I was able to confirm the fact already announced by the first Spanish navigators and by the hydrographers of the "Beagle," that the Andean Cordillera was traversed by channels which conveyed the salt waters of the Pacific to the Patagonian plains, and that the chain, shown in many maps as separating Otway Water from the Straits of Magellan,

does not exist, the isthmus consisting of an insignificant deposit of loose stones and sand left by the ice, and scarcely raised above sea-level. In 1877, some Chilian officers visited the sources of the river Santa Cruz in the lake. Steinmann shortly afterwards reached the same point, as well as the Argentine travellers, Castillo, Moyano, and Lista. Moyano crossed from Santa Cruz to the Chubut, partly following the route taken by Musters and that of Durnford, who had visited lakes Musters and Colhue in 1877. In 1879 I again returned to the Rio Negro, crossed Patagonia as far as the Cordillera, on parallel 44, and followed the slopes towards the north, again examining lake Nahuel-Huapi, and reaching nearly up to parallel 39°. If, up to that time, the surveying of

EASTERN SLOPE OF THE CORDILLERA OF THE ANDES AT LAST HOPE INLET.

those regions was not exempt from a certain amount of danger, in view of the attitude of the native tribes, this danger disappeared after the defeat inflicted upon them by the Argentine forces. It was at this period that the 1881 treaty was made, by which Argentina and Chile remained separated in Patagonia, to the north of parallel 52°, by the Andean Cordillera; and expeditions continued to explore the latter. The treaty stated that the boundary between the two countries was the Cordillera of the Andes, and that the dividing line was to run along the watershed of the highest crest. But when boundary treaties are not preceded by an adequate survey of the land on which this boundary is to be traced, they always give rise to difficulties when they are being

actually carried into effect. These difficulties soon arose. Which was the line agreed upon? The Argentines maintained that it was the crest of the Cordillera in its watershed; whereas the Chilians advanced the opinion that the boundary agreed upon was the parting of the continental waters, whether that coincided or not with the crest, or was situated outside, and at a distance from, the Cordillera.

Chile sent out explorers, who penetrated the country from the west; and the Argentine Republic did the same. I myself set to work to carry out similar investigations with the conviction that, in the same way as the logical development of a nation is not achieved unless the geography of its territory be known, nothing can be more prejudicial to its interests than such ignorance in discussions relating to its frontiers. From 1882 to 1895, I examined the Andean regions of the Republic, between parallels 23° and 34°; and, in 1896, I returned to Patagonia by the slopes of the Cordillera and the interior thereof, until I reached Lake Buenos Aires, in 46° 30′. In 1897 I visited the Patagonian region situated between the Straits of Magellan and parallel 51°, and examined several of the western fjords as far as Puerto Montt, in latitude 42°. In 1898 I ascended, for the second time, the Santa Cruz river, reaching the same point visited by me the previous year, on parallel 51°, and, along the eastern slopes, I traversed the territory as far as Lake Nahuel-Huapi and Puerto Montt. It is with this material that I purpose giving a sketch of what Patagonia is, under various aspects; the deficiencies of which sketch will, I think, be made good by the photographs I shall show.

II.

Many of the Patagonian landscapes will certainly be surprising. Captain Fitzroy and Charles Darwin were very unfortunate when they explored the river Santa Cruz. The landscapes left a disagreeable impression on them; and this impression subsequently became general with regard to the whole of Patagonia. In my own country I have found considerable difficulty in obtaining a hearing when I have stated that, although the English explorers spoke the truth, and that any one visiting the same spots would receive the same impression as they did, nevertheless, Patagonia did not merit its bad reputation; but, on the contrary, a vast field for human initiative existed there, with a healthy soil capable of supporting a large population.

In comparing the mountains of South America with those of North America, we might say that the Brazilian mountains have a corresponding situation to the Appalachians; that some of the Peruvian, Bolivian, and Argentine ranges have an analogous position to the Rocky Mountains; whilst the Andean Cordillera corresponds to the ranges on the North Pacific coast. The same vast plains, the same great ridges, and almost the same high plateaus, characterize them. The landscapes

of the Mississippi are reproduced on the Paraná; the broken plains and the plateaus of New Mexico and Arizona find their analogy in the Argentine northern plateaus and in the table-lands of Patagonia; whilst the ice-bound plains of Canada find modest companions in the extreme south; and the picturesque fjords and white mountains of Alaska seem to be a copy of the fjords and mountains of Patagonia, or *vice versâ*. The analogy might be carried still further. It is surprising what a similarity exists between the ancient industries of the natives of New Mexico and those of north-west Argentina; and any one who compares the ancient customs and industries of the coast of the Pacific Ocean—at either extremity—will obtain some curious revelations.

MYLODON CAVE NEAR LAST HOPE INLET.

The territorial area of Argentina consists of more than a million square miles, and, in three-quarters of its extent, presents the contrast of the most level plains in the world, with mountains which may be reckoned amongst the highest. With the exception of the rugged nature of the north-west regions, which are prolongations of the mountains of Bolivia, and a few small islands of the ancient Pampean sea—so well described by our associate, Colonel George Earl Church—one passes from the superficies of the said sea to the abrupt wall of the mountain in so striking a manner that the natives call the slopes, the "Costa," thus, perhaps, evoking the lost sea or the great lakes which filled it, and of which traces still exist, and which indubitably existed in the human period.

This spectacle of the mountain abruptly dominating the plain, stops at the height of parallel 34°, and the vast *pampa* is scarcely interrupted at the south by the archaic and paleozoic rocks of the Tandil, the Ventana and the Pampa Central, bounded on the east by the Atlantic, and on the west by the scarcely discernible continuation of the central-northern ridges which divide the plain of a western depression that commences in Bolivia, in lake Titicaca, or further north, and carries the waters of the Eastern Andean region of Argentina to the Atlantic by the river Colorado. This depression is, in its turn, limited on the south by the plateau which separates it from the Rio Negro, and it is this plateau which is generally considered as the northern limit of Patagonia; although, owing to many of its physiographical features, the Patagonian *facies* may be considered as extending as far as the Bolivian plateaus of the Titicaca, agreeing generally with its flora and fauna.

It is difficult to state briefly what ought to be understood by the expression "Patagonian Region" in its general characteristics; and I must, for the present, confine myself to assign its political limits which, on the north, are the Rio Negro; on the south, the Straits of Magellan; and, on the east and west, the ocean. Within its 300,000 square miles, the landscapes offer striking contrasts. To the east, from the sea, are seen coasts with smooth horizontal surfaces, with slight prominences between parallels 44° and 47°, caused by eruptive formations; a coast which is the cliff of the traditional table-land, streaked with grey, yellow and white bands, of dreary aspect, with perpendicular walls, and a scarcity of ports. On the western side, the scenery is utterly different: a number of islands, with abrupt and wooded coasts, fringe the precipitous coast-line of the continent, which is indented by numerous fjords that penetrate to the very heart of the Cordillera and traverse it completely in the 52° of latitude; a coast similar to that of Norway, or, better still, to that of Alaska, with glaciers reaching down to the sea from parallel 44° 30′, and three-quarters of the mountains covered with ice and snow.

Between the two coasts, terraces cut into the elevated plateau, some extensive, others reduced, form the table-lands, separated by depressions (the most extensive, being transversal), generally covered with a layer of pebbles, and, here and there, by lava-streams, between the remains of the ancient range which has nearly disappeared from the centre, which remains are, perhaps, the continuation of the mountains of Central Northern Argentina, and in the west a longitudinal depression that precedes the Andean Cordillera and lies parallel to it. This depression is of a smooth and gently undulating character, of an exclusively erosive and glacial aspect, but evidently of tectonic origin, very beautiful, dotted with numerous lakes. Some of these lakes empty themselves into the monotonous Atlantic rivers; others reach the Pacific in impetuous torrents which cut through the whole mass of the Cordillera. The

hydrographical network is then so rambling, that it is not always possible to fix the exact course of some of its secondary components, which sometimes flow into the Atlantic rivers, and at other times into those of the Pacific, their course often depending on periods of rain or drought, or the shifting of sand or shingle, and also, sometimes in certain springs, on the action of rodents, which are a veritable calamity in Patagonia, but easy to remedy. This phenomenon of a dividing-line of waters flowing into opposite oceans, which partly rise in plains and glens hardly higher than the level of the sea, and which overcome such formidable obstacles as the Andean Cordillera, piercing its crystalline axis and the

CONTINENTAL DIVIDE IN THE GLACIAL DEPOSITS OF RIVER VISCACHAS.

enormous mass of rocks which have accumulated upon this axis, constitutes, in my opinion, a fact which is unique in the world.

It is very possible that, when a careful survey of the Andean Cordillera and its vicinity is made, it will be proved that a great portion of its actual upheaval took place in very modern epochs; and that man, already possessing a culture analogous, to a certain extent, to that of nations which are reputed civilized, witnessed the modification of the physiognomy of the soil of South America. It seems to me incredible that man could have found means of existence at an altitude of 18,000 feet, and yet, at this elevation, on the Puna de Atacama,

human remains have been found, which proves that he did. The gigantic ruins of the Bolivian table-lands suggest that the upheaval of the soil to its present altitude was subsequent to the construction of the buildings, the ruins of which are preserved, as man could not now construct similar works there. I have seen on the Puna de Atacama, in parallel 26°, at an altitude of 14,000 feet, the remains of extensive villages, where it would not now be possible for moderate groups of people to live. It is well known that there are abundant remains of the great pampean mammalia in the clay formations of the Bolivian plateaus; and it is difficult to believe that such animals could have lived at that altitude.

The extreme south participates in this recent upheaval of the Earth's surface, and its orography is intimately connected with this movement, which is still going on, and which is, with erosion, also probably one of the causes of the abnormal water-divide of the continent leaving the crest of the Cordillera in Patagonia, to transfer itself to the plains lying alone on its eastern slopes. Charles Darwin has left us some observations of the utmost value with respect to the upheaval of the Earth's surface in South America; and it is a matter for regret that they have not been continued with similar attention by subsequent observers.

If a careful examination be made of the accounts given by the early navigators who visited the extreme south of America, we shall find that the country, as they saw it, has been modified in several places. It is very possible that some remains of the channel shown in some of the maps, between Admiralty sound and San Sebastian bay, in Tierra del Fuego, existed at that period; that the isthmus which separates Otway Water from Magellan straits, did not then rise above high-water mark; and that several of the streams now flowing into the Pacific from the east of the Cordillera, and even from the Patagonian plains, crossed them to reach the Atlantic:—a mass of facts which ought to attract militant investigators, all the more that the places in which they are to be observed are, more or less, easy of access, compared with other places in the world, of less interest, but which, nevertheless, are much better known.

In the reports of Dr. Otto Nordenskjöld, the Society possesses a general exact picture of the physiognomy of the large island of Tierra del Fuego. This island I have only seen from the sea; and Sir Martin Conway has graphically described the mountainous western portion. My description will commence, then, in the Straits of Magellan. When the coast is observed from the Atlantic, one sees the straight line of the terraces on both sides, and the others of Virgin Cape. Once in the straits to the north, on the low base formed by the coast, the tertiary line stands out, now receding, now advancing; its regular summits broken by small hills, which are so many extinct volcanoes. At the foot of the

plateaus, gorges and low hillocks fill up the ancient extension of sea waters, which, not very long ago, dashed at the foot of the plateau, but now are far away. To the south, in Tierra del Fuego, the same dreary views exist, but minus the volcanoes, the effects of which are only seen, in a very limited area, near the straits; and so one reaches the west, until, to the north, the principal table-land is seen rising towards the west and penetrating towards the north-west, forming a vast circle, which is lost in the distance, snow-capped mountains rising on the horizon. To the south, the grand Fuegian island terminates, after leaving the narrows; and the northern beach continues along the vast sheet of the straits.

The Patagonian tertiary formation ceases there, and with it its characteristic aspect. Steamers anchor in Punta Arenas, in the ancient island, now the Brunswick peninsula. From there, in clear weather, can be seen, to the south, the snow-capped summits of Mounts Sarmiento, Darwin, and Olivaia, in the high ranges which are the continuation of the Chilian Cordillera of the Coast and the Cordillera of the Andes, which are lost to view in Staten island and Cape Horn. Any one who follows the navigation of the straits will not fail to perceive the curious topography of the region and its varying outlines. It has the appearance of recently inundated land, from which the waters are receding after having covered it entirely. More than once, in crossing Patagonia, I have recalled to my mind the appearance of Magellan straits when I found myself in the transversal depressions which cross the country, and I have imagined a cluster of more or less extensive islands, of a general elevation analogous, and of similar type, to that formed, at no very distant date, by Magellan straits and what we might call the Straits of Gallegos.

The islands of this archipelago, formed by upheavals and submergences, connected with the tectonic movements which have formed the present Andean cordillera, and to which movements must be ascribed the fractures which give the austral region such a characteristic aspect, were separated from one another by straits similar to Magellan, which straits disappeared with the general upheaval and the glacial deposits, leaving more or less extensive valleys through which flow the rivers Negro, Chubut, Santa Cruz, Coile, and Gallegos and its affluents, and others having no permanent fluvial currents. It has been said that the interior of Patagonia is formed by a succession of terraces, having an east-to-west direction up to the Cordillera; this does not appear to me to be altogether exact, but it is indubitable that at one time the whole region rose uniformly to a greater height in the west than along the present Atlantic coast. The Saint Gregory cliffs in the straits, in their western part, are more or less of the same elevation as those of the confluence of the Rio Negro and the Limay, in parallel 39°; the same topographical features distinguish these cliffs near the mountains;

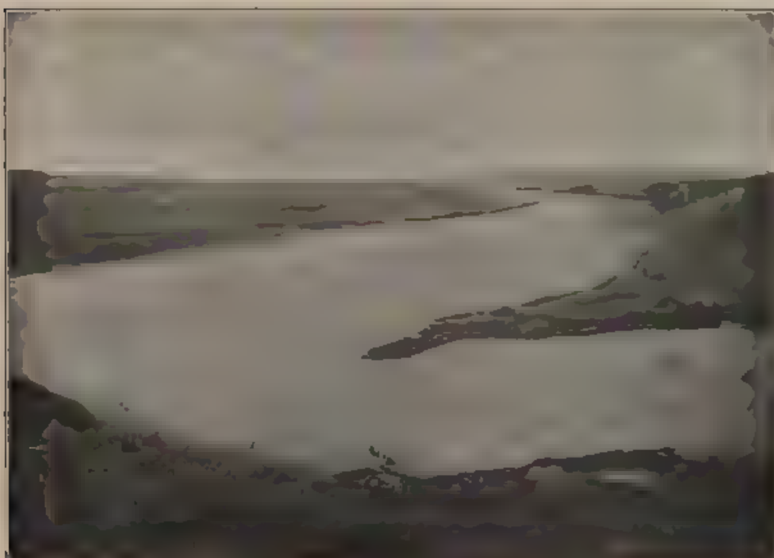
and we might assert, even, that their strata are of the same age, as is proved by the fossils which have been found in them. The recent volcanic eruptions extend from parallel 41° up to the straits in the same zone; and the periods of eruption seem to have been almost indentical; the Mount Aymond volcanoes are similar to those of Mount Yagagtu in Rio Negro territory. The uniformity is almost general: the same geology, the same fauna, and the same flora; and it only alters in the north with the remains of the longitudinal ridges which appear to the south of Rio Negro with its granites, porphyries, trachytes, and ancient schists, extending, in more or less imposing masses, as far as the river of port Desire, dividing Patagonia and its table-lands into two parts, north of this parallel. I am of opinion that, in the early days of the tertiary formation, Patagonia was of greater extent than at present; that a part of its territory advanced much further into the Atlantic; and that the bed of the latter, between the present coast-line and the eastern parts of the Falkland islands, was nothing else than a plateau, submerged at a relatively modern epoch, the upheaval of which has again commenced.

The bold, characteristic relief of the Patagonian terraces is intimately connected with the upheavals, and erosions produced by great rivers and lakes, the greater part of which have since disappeared. These terraces are really true lines of level left by these rivers and lakes, which did not all, however, have their origin in the present Cordillera; but some had their origin in the centre of the country, which to-day is almost entirely waterless, and which, it also appears to me, were connected with lands which have now disappeared.

The larger number of the lakes which fed these rivers in the Andean region still exists; but of those of the central region scarcely any remain; the twin lakes Musters and Colhue are rapidly drying up, together with a few insignificant lagoons. Nevertheless, when the territory is crossed, one sees great cavities—empty lakes and vestiges of their powerful outflows. Their shores present characteristic terraced levels; and in connecting their lines of elevation, one finds that, as I have remarked, the terracing is not generally regular. The present terraces are nothing but the evidences which have been left by ancient lacustrine or fluvial levels; and although the altitude above the sea of the strata of which the general table-land is composed is greater on the west—thus exposing to view others on the western border of the plateau which do not appear in the Atlantic coast—this fact is not of a perfectly absolute uniformity, as, in San Julian on the sea-coast, cretaceous strata are observed, as also in the vicinity of the Cordillera.

The monotonous plateaus generally terminate, as I have stated, in the vicinity of the first mountains, which are parallel with the true Cordillera, and the general character of the Patagonian region completely changes. If you examine the map of South America, you will

see that, to the south, two chains of mountains exist: the Cordillera of the Andes, and the Cordillera of the coast in Chile. It may be said that, from the Atacama desert, the two chains run parallel to each other; at times their spurs seem to become confounded; but the geologists Pissis and Domeiko have pointed out an intermediary valley running between them, throughout their extension, from north to south. In the north, this valley is filled principally by the products of recent volcanoes; it is then contracted, and almost obliterated, by the spurs referred to; but it subsequently widens out to form the very fertile central valley of Chile, gradually descending to the south until it buries itself beneath the Pacific, opening out or contracting itself, as in the



RIVER SANTA CRUZ

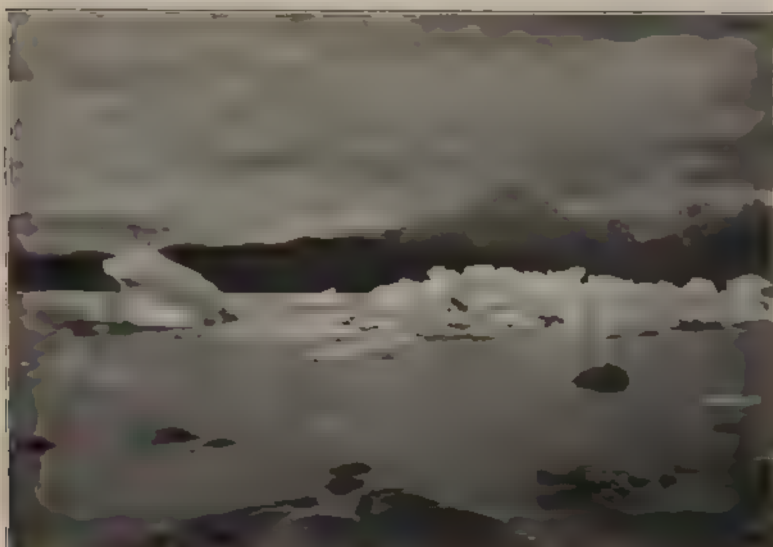
north, and covered with alluvial deposits and ashes even under the coast waters of the Pacific, as far as Tierra del Fuego; a tectonic valley, and perhaps one of the longest in the world. Parallel to this, but situated to the east of the Cordillera, a similar valley is found, the existence of which was suggested by me in 1879, which is more or less continuously contracted or effaced by the same causes, but not completely buried under water, as has happened to the western valley. The Andean Cordillera rises between the two depressions. The Chilian valley penetrates the sea at parallel 42°; but three degrees above, the chief part of its extension, it is occupied by a series of lakes, generally transversal, which seem to fill cavities that coincide with profound ravines in the Cordillera, whereas the Argentine valley only

sinks beneath the sea 10° further south. In this eastern longitudinal valley, the actual lacustrine series fills the space comprised between parallels 38° and 52°, at times interrupted by local tectonic accidents, which took place after its period of formation, or by vulcanism or accumulations of glacial detritus. This general valley forms one of the most interesting, most fertile, and most beautiful zones of South America, owing to the variety of its topographical forms, the geological construction of the enclosing mountains—which breaks the monotonous grey of the Alpine views—the flora with which it is adorned, and the immense glaciers, some of which send crystalline icebergs into the green or blue waters of the lakes. Another Patagonian contrast is the white and blue ice on the black basalts, crenellated peaks, and cliffs of monumental shape reflecting themselves in the waters of the western shores of the lakes, mingled with the leafy garlands formed by the woods, so rich and varied in their flora; whilst to the east, bare of arboreal vegetation and monotonous, rises the precipitous plateau. At a jump, one passes from the elevated flats of the arid volcanic plateaus to green fields and wooded valleys; from stiff and miserable bushes to the handsome fern and fuchsia region.

Setting out from Punta Arenas, towards the north, the woods cover the cretaceous hills, and the road mainly follows the high-water mark, winding between rocks, the erratic remains of the now almost obliterated moraines, and partly traverses beautiful fields. Under the trunks of old trees one meets with deposits of molluscs, the remains of meals of the ancient natives. In this way one arrives at the isthmus between Otway water and the straits; the ground undulates, the woods disappear, and, gradually, erratic boulders become visible everywhere, looking like small isolated hillocks between the cretaceous hills and the distant cliffs of the Saint Gregory plateau and the straits, where salt lakes—vestiges of the very modern upheaval of the region—are to be seen. Immediately to the west is Otway Water; and at the bottom the low hills of King William's land, which precede the "Cordillera Nevada."

The Andine eastern longitudinal depression is partly represented there by the Fitzroy channel, and its vicinity is dominated by the edge of the western tertiary plateau, which rises gradually, cut out on the western shores and ravines by rain and frost; and, to the east, the volcanoes Orejas de Burro, Mount Aymond, and La Picana, from 700 to 1000 feet altitude. I have already remarked that the plateau commands the straits from Virgin cape. Between this and the valley of the river Gallegos, the undulating surface is grassy, sparse in timber, with deep gorges which cross each other, and with volcanic cones which have scattered lava-streams in ancient and recent times. Hundreds of thousands of sheep now pasture upon it, whilst in the deep gorges of the Atlantic coast, gold-seekers continue their researches in the glacial deposits. The Argentine-Chilian frontier line crosses it from

east to west, up to Mount Aymond, deviating from that point up to the intersection of meridian 70° from Greenwich with parallel 52°, at the base of the Picana crater, to follow the parallel to the coast of the western channels. These volcanoes appear as though they did not extend to the west of the longitudiual depression, as I have not seen there, amongst the rocks moved down by the ice, any pieces of lava. An arenaceous conglomerate, covered with erratic boulders of granite and quartzite, separates another glacial depression filled by the Blanca lagoon, which is now gradually disappearing, divided into two sections, the northern limit being the edge of the plateau which continues to the Campana hill, which forms its western extremity. The surface of this



WESTERN ARM OF LAKE ARGENTINO.

is always undulating pasture land, and shows, on the west, small groves of *Fagus pumilio.* To the north and east flow affluents of the river Gallegos, and to the west, rounded hills, dotted with erratic boulders, rise above the plateau.

The northern edge of the table-land overlooks another transverse valley of the continent, an ancient strait, as I have said before, in which the river Gallegos now runs, and at its base several andesitic hills are encountered, which rise up above the valley in the vicinity of the two edges of the plateau, but without attaining the altitude of the latter. The broad valley which extends between Obstruction sound and the Atlantic ocean, an ancient channel filled with glacial detritus, which gives it a characteristic appearance, with extensive lateral

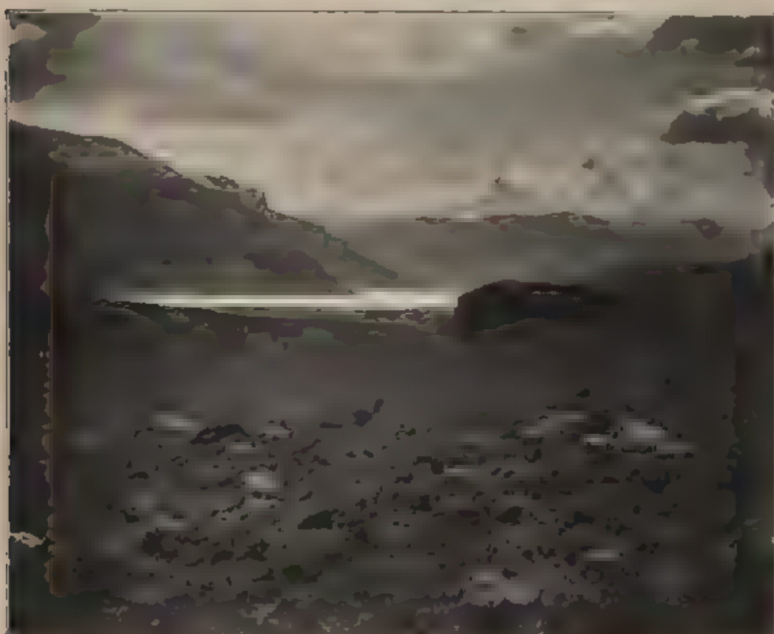
moraines and frontings cut by the great glacial river, the gradual decline of which is shown by the terraces left by its distinct levels.

When the Spanish navigator, Ladrillero, in 1557, entered the channels to the west of the Cordillera, in search of a passage to the Atlantic, he found low-lying lands, and in them a channel more than 45 miles long by 4½ wide, penetrating east-north-east. In 1830 Lieutenant Skyring and Mate Kirke, of the *Beagle*, explored the same regions, and observed a vast expanse of water divided by a low isthmus cut by a river which drained it, the remains of the Ladrillero channel. I say "remains," as I think that the elevation of this isthmus is of very recent date, as indicated by the young trees referred to by Kirke. This sheet of water is now known by the name of Lake Balmaceda; and to the south of this another one of the same size, Lake Pinto, is found, whilst to the east there are other smaller ones, situated between various lines of moraines, more or less destroyed, which separate the waters that, from the northern and southern plateau, flow westward to feed these waters, and, eastward, to form the river Gallegos. This is a characteristic glacial landscape; the boulder clay, which is seen very distinctly in the Blanca lagoon, fills the valley, being displayed in large patches in the same way as is observed in all the other northern valleys. The remains of dividing moraines does not attain in some parts an altitude of 200 feet above sea-level, and abounds in large erratic, perfectly striated rocks.

This river and its affluents flow in a capricious and winding manner, leaving on either side the marshy remains of the ancient fresh-water channel. Imagine the British Channel dry, covered with boulder clay deposits, and a river wandering in its centre to the east, receiving streams from the cliffs of the two coasts, while little hillocks, like those in some parts of London, separate the western streams from little lakes overflowing in that direction to the Atlantic, and you will have the impression of every one of the transverse depressions of Patagonia, the western Atlantic being replaced there by the Pacific channels or the Andean lakes. Lake Balmaceda measures, approximately, 40 square miles, and is partly fed by the waters of other smaller lakes and by streams. Between the most eastern of these lakes and a group of smaller ones which send their waters to the river Gallegos, there is a glacial deposit barely 60 feet wide. In times of flood, these small lakes communicate with each other, and for the time confound the waters flowing to the Pacific with those which go to the Atlantic. It also seems that one of the affluent rivulets of Lake Balmaceda is thrown off from the river Rubens, an affluent of the Gallegos. This river and its affluents have a winding channel, leaving lagoons on either side, the remains of the ancient channel now replaced by the valley.

The present transverse valley takes part in the longitudinal depression

now occupied by the waters of the Pacific, and is bounded on the south by the plateau extending between the Gallegos river and Magellan strait, and on the north by what has been called the Latorre Cordillera, which is not a mountain range, but the continuation of the general table-land itself. Between this and the channels, rise, south of the parallel 52°, the cretaceous ridges, Rotunda and Palladium hills, and to the west, the mountains in front of the principal chain of the Cordillera, here formed by the Sarmiento Cordillera. In Last Hope inlet, which forms a part of these channels, the eastern longitudinal



ANCIENT EASTERN OUTLET OF THE LAKE SAN MARTIN.

valley depression, to which I have referred, terminates under the sea-water.

Dr. Otto Nordenskjold has given the Society a general description of the part of this depression comprised between the Sierra de los Baguales and the Last Hope inlet, and I will only dwell on this in order to amplify these *data* with a few new observations which complete them. If one penetrates to the extreme west of the Last Hope inlet, this is seen to open out into three branches; the centre one gives entrance to a small lake situated in an opening, which it seems had previously communicated with the Canal de las Montañas, in the extreme north of which flows a river draining another lake, likewise situated in the same depression. The Canal de las Montañas constitutes

the extreme end of a longitudinal valley which separates there the central chain of the Andean Cordillera from the more fragmentary lateral ridges, and to which Mount Balmaceda belongs, and at the eastern base of which the river Serrano empties, bringing to the inlet the waters of the eastern general depression from Mount Stokes glacier, which feeds Lake Dickson. The same river also receives the waters of the central chain, at the base of which is Lake Tyndall, which is bounded on the west by a sheet of ice, truly *Inlandeis*, the remains of that which, in other times, covered the region as far as the present Atlantic coast. All the lakes of the region, even the eastern lagoons, are remains of a single lake which emptied into the river Coile; whilst the present Pacific channels formed another, which also emptied into the Atlantic by way of the river Gallegos, and before the erosion wearing away the rocks in Kirke straits connected the ancient lake with the Pacific, converting the fresh waters into salt.

To-day, between the Patagonian plateau and the Cordillera are found lakes Maravilla (the largest, and the moraines of which are perfectly preserved), Sarmiento (without visible outlet—which must be subterranean—also surrounded by moraines), Paine, Hauthal and Tyndall, Nordenskjöld and Dickson, besides others, the existence of which is known, but which have not been closely inspected. These lakes, formed in tectonic fractures and continued in depressions cut out by the ice, are separated from each other by isolated mountains, of more or less altitude, some having extensive glaciers, as in the case of the interesting Mount Paine, a beautiful massive tertiary granitic laccolithe capped with cretaceous slates, connected by a transversal ridge with the main chain of the Cordillera, and not a volcano as Dr. Nordenskjöld thought; others formed of the same slates, of less height, and with rounder peaks, presenting the form of a whale-back—the name one of them bears—all being mountains which formed the islands of the great exhausted lake, the bed of which, to a great extent, has disappeared, either through the upheaval of the soil or through the glacial detritus which covers all the shores. The landscape is extremely picturesque in this region. To the west, the high mountains of the granitic central chain, with its ice-field and its *nunatacks*; lower down, wooded valleys and the mountain-lakes between the fjords studded with icebergs detached from the ice-fields. Then come the wooded mountains, some with glaciers, of the lateral ridge, formed by metamorphic schists, probably of the lower cretaceous, cut by the deep lakes and by the rivers which drain them. Next we have glacial lakes, occupying the old mouth of the lost fjords, and surrounded with moraines on the east; and, on the north and south cretaceous mountains covered with woods, and hills polished by the lost glacier of the first extension of the glacial period. Then follow the tops of the little transition hills, of the upper cretaceous, which precede the tertiary table-land, and which it may be said limits

the longitudinal depression. The western slates, greatly contorted, assume fantastic forms with their folds, through the deposits of snow between the layers, and rise perpendicularly above the fjords. In one of these intermediary hills, near Last Hope inlet, is situated the cave where the piece of *mylodon* skin was found which has so much attracted the attention of English naturalists. The explanation of the presence there of this extremely interesting piece is difficult; at a time when the animal died, probably the cave was not situated at the same altitude as it is to-day, and the proof of this is the perforation of the rock by pholades. The discovery made by the geologist, Mr. Hauthal, one of my travelling companions, of a bank of *Mytilus edulis*, situated about 7 feet above sea-level, is an evident proof that the upheaval continues.

As I have already said, the transition is violent between the Cordillera and the Patagonian plain; it is most notable in this part of the depression. To the west from the high raised cliff, called Sierra Dorotea, and inclined in the same direction, the tertiary sandstone appears, which extends from the Straits of Magellan, always cut by the transversal depressions, which, further north, surround the base of the Sierras Baguales and Viscachas. This sandstone, in its turn, is covered by the neo-volcanic tuffs, and the glacial gravel deposits which form the so-called Latorre Cordillera, and which, as I have said, is only the characteristic Patagonian plateau, gradually rising from the Atlantic towards the Cordillera, to which, perhaps, at one time, it was united. I have visited the depression and the plateau, and in my excursions I have crossed all the transversal depressions, and have always found the same physiographical character. The tertiary sediments rise gradually from the Atlantic towards the Cordillera; in the vicinity of the latter cretaceous formations appear with tertiary eruptive rocks, the upper ones under the tertiary, the lower exposed at the surface in the centre of the depression, bordering the chains of the Cordillera composed of gneiss, granite, and quartzite, and some sandstones of undetermined age. On the table-land there are more or less extensive patches of volcanic eruptions with their tuffs; the part played by these eruptions in the upheaval of the soil it is not yet possible to determine conclusively, but they have taken place during the whole of the tertiary period up to recent times.

Between the Sierra Dorotea and Punta Alta rises the principal affluent of the Gallegos river, which waters the whole valley, and is occupied by important *estancias*, as is also the case in the neighbourhood of Lakes Maravilla, Sarmiento, and Paine. I have crossed the Patagonian plateau in the vicinity of the Atlantic, and also between Punta Arenas and the Sierra de los Baguales, and, *de visu*, I can state that, although, looking at the cliff from Obstruction sound, it may be considered as a mountain ridge, it has not the slightest analogy with the general idea of a mountain. Its surface, generally flat, with small

undulations produced by glacial erosion, more numerous on the west, covered with gravel, and displaying erratic boulders of great size, extends towards the east, losing itself in the horizon, abounding with guanacos and ostriches, poor in trees and pastures, forming another ancient island between the transversal depressions of the Gallegos and Coile rivers, which also carried to the Atlantic, in other days, the waters of that part of the Cordillera in their broad channel. To-day the enormous accumulation of glacial detritus has modified the hydrographic regimen. At the extremity of the north-west cliff of the plateau rises the principal arm of the river Coile and also the Guillermo rivulet, which flows westward to empty in Lake Maravilla, forming, in this way, another instance of the water-parting of the continent in the plain, on the east of the Cordillera. The landscape is essentially glacial; the various semicircles of the moraines and the winding ridges are seen with perfect clearness, and have accumulated such a quantity of remains, that it must be admitted that the glaciers which produced these accidents had no great oscillations before retiring to where they are now seen in the Cordillera. Large erratic boulders abound as far as 50 miles east of the present snowy mountains; and on the shore of the Coile, near the so-called Mount Palique, a tertiary hillock, covered by the remains of a moraine, I have seen some granitic rocks measuring as much as 400 cubic yards. This so-called Palique mountain is washed on the east by the Viscachas rivulet, one of the most interesting streams of the region, and similar in its characteristics to the river Fenix, to which I shall refer.

The transversal shores of the Sarmiento-Coile's ancient channel is bounded on the north by the Baguales mountains and Viscachas plateau. These mountains were formed by a general upheaval, greater to the west of the plateau, their relief having been increased by modern eruptions, and on the west by cretaceous rocks, among which Hauthal saw layers of diorite, which have accentuated by their upheaval the relief of the mountains. They appear to be separated from the Cordillera by the continuation of the longitudinal depression, which is contracted in that part, and filled with ice from the mass to which Mount Stokes belongs. This glacier separates the basins of the southern lakes from that of Lake Argentine, which feeds the river Santa Cruz, thus sending waters to the Atlantic and waters to the Pacific, by the eastern side of the Cordillera. These waters flow southward to Lake Maravilla by three main streams — the rivers Zamora, Baguales, and Viscachas. The latter, which is the most eastern, and rises in the basaltic plateau, has a course particularly worthy of notice: first it flows to the south-east; then it inclines further east, to again twist violently to the west to the foot of the Palique hill. I have examined these points, and found there one of the most interesting cases of river-capture of Patagonia. In March, 1898, a ledge of shingle and sand, scarcely

3 feet in height, divided the river Viscachas from other channels, then dry, which in the rainy season flowed to the Atlantic; and the natives of the place assured me that at certain periods, when it was in flood after the melting of the snows, the waters flow indiscriminately towards both sides. To-day the waters are diminishing on the east of Patagonia; for some years past rains have been less frequent, and this diminution explains certain phenomena produced there in their distribution.

The Gallegos-Coile plateau turns to the east, diminishing in elevation, eroded by glacial action into cavities, having fresh and salt water ponds or pools, the remaining vestiges left by the Atlantic at the time of the last upheaval of the table-land, until it contracts to the transverse

ANCIENT EASTERN OUTLET OF LAKE BELGRANO.

valley through which the principal affluent of the Coile river runs. If this is crossed and traversed to the north, ascending and descending the undulations covered with glacial mud and with great erratic blocks, and a grassy country which will soon pasture thousands of sheep, one penetrates into the broken ground of the east of Sierra Viscachas between lava-streams of the most picturesque aspect. This is one of the points of Patagonia where the layer of glacial gravel which covers it is most visible. It is seen that, in certain places, the horizontal character of its layers has undergone modifications, and I have examined places in which the gravel layers may be said to be almost vertical, which is only explicable by very recent subsidence or faults. I crossed the plateau from the middle of the Santa Cruz valley to the west, and took the opportunity

to examine its terraces and the isolated depressions of ancient levels, and I think I am safe in asserting, supported by observations made at other points, that some of the depressions of the plateau, and therefore some of the elevations of its borders, are caused by local subsidences, such as occurred in the Yagnagoo plain in the territory of Rio Negro. The St. Joseph bay and New Bay, on the east coast, must have the same origin. Some low hills which are seen on the plateau are entirely composed of beds of stratified rounded gravel, and appear to be the remains of a general layer which has now almost disappeared.

As always happens in Patagonia, the region is more broken to the west than to the east of the plateau; deep gorges, more or less wide, contain rivulets, the remains of the rivers which in former times fed the great Coile drainage system, which river has not a continuous course all the year round.

From the open plateau (2500 feet) one overlooks the extensive valley of the river Santa Cruz, which is deeper than that of the river Gallegos and that of the Coile, being more stony and sterile. I ascended the river Santa Cruz in 1877 and 1898, and I can appreciate the labours of Fitzroy and Darwin when they tried unsuccessfully, to reach its sources. Undoubtedly the great river will be easily navigable by steamers when its channel is once known, its current not being extraordinary, seeing that it was always overcome with a small 9-knot steam-launch during my last ascent.

This is another of the transverse depressions of the continent, opened in tertiary layers, always the same. Only here the basaltic lavas cover the plateau in a great part of its western third, and upon it the craters which produced them stand out. The tertiary cliffs of this valley, from the Atlantic to Lake Argentino, have furnished the remains of very interesting fauna peculiar to Patagonia, upon which I cannot now enlarge.

The valley of the Santa Cruz has also been occupied by ice, and is covered with its detritus. To the east of Lake Argentino, where it rises, one sees on the cliff which overlooks the present river, 150 feet above it, erratic boulders of 600 cubic yards, which have been left by the glacier that formerly covered the lake, the moraines of which limit it.

Lake Argentino is more extensive than Lake Maravilla, partaking of the tectonic and glacial lakes. It extends 60 miles to the west; and the fjords of its extreme west divide into three arms, which receive the waters of large glaciers from Mount Stokes up to the vicinity of Lake Viedma. An important river flows into the end of the north fjord, with clear waters—a sure sign that it proceeds from another great lake still unknown. The western end is closed by the main chain of the Cordillera with its glaciers, which cross to the Pacific fjords of Peel inlet and St. Andrew's sound, and one can distinguish peaks

more than 10,000 feet, as Mount Agassiz (10,597 feet). The lacustrine fjords correspond to the western channels, and communicate with those of the south by the glacier of Mount Stokes by Lake Dickson. Undoubtedly Lake Argentino was more extensive formerly. Mount Buenos Aires and Mount Frias were, in very recent times, islands in the southern part of the lake. To-day the waters are rapidly retiring; a large expanse of the southern shore, which was under water when I saw it in 1877, was dry in 1898. The lands left by the retiring waters are very fertile, and the last time I visited the spot several thousand head of cattle were grazing, having been brought there by two

MOUTH OF THE RIVER LAS HERAS, IN THE CALEN INLET.

English cattle-raisers. This is the first herd that has been raised in such distant regions.

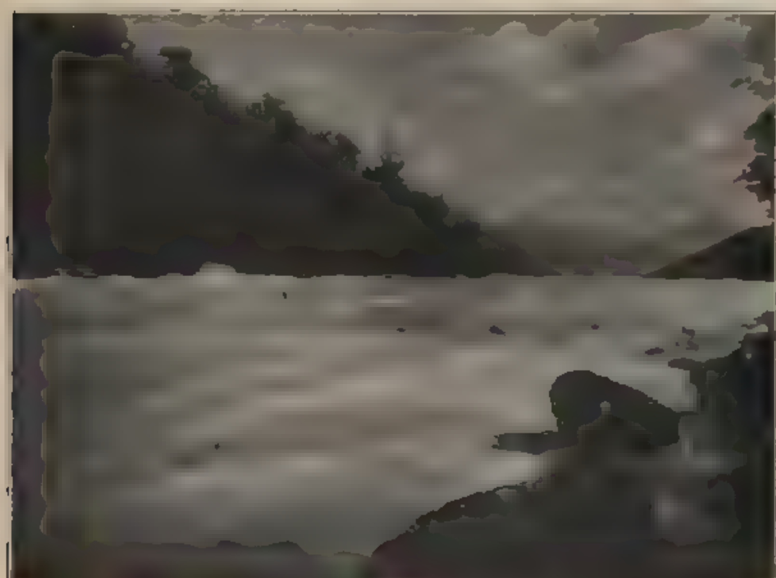
The river Leona drains into the eastern extremity of Lake Argentino, to which it carries the waters of Lake Viedma. This river has a stronger current than the Santa Cruz, between upper cretaceous cliffs, crowned by fossiliferous tertiary caps, which are also observable at the south of the former lake, in which abundant saurian remains have been found. The cretaceous marine formation is observed to the west, at the base of Hobler Hill and Castle Hill, mountains named by Fitzroy, who saw them in the distance. I ascended Leona river in the same steam-launch which had been up the Santa Cruz, and I believe that this river would be easily

navigable when once it had been surveyed. The cliffs, completely denuded in the vicinity of Lake Viedma, are composed of clays, sands, and volcanic tuffs, contain numerous tertiary mammal remains, which await the collector. The gravel cap which covers them did not seem to me so thick as it is further south, and perhaps may have been swept away more easily, as the ravines are at first more frequently produced, perhaps, by neighbouring volcanic eruptions.

Lake Viedma (828 feet) is larger than Lake Argentino, and of a more regular shape in the points examined by my assistants, although it would not be surprising if it had fjords similar to the latter. A vast glacier reaches to the water, and, in clear weather, I have seen it descending from the west like an immense ice-field, from the crest of the central chain, 10,000 feet high, which the ice covers up to its western slope in Eyre sound. To the south and north of this other narrower glaciers are seen in the extremity of the fjord-like bays.

This lake also occupies a tectonic depression, which stretched to the Atlantic, and has had a much greater extension than Lake Argentino, which it still exceeds in extent. At its eastern extremity an extensive ancient arm is seen, which continues up to the narrower valley of the Shehuen river, which empties into the Chico river before it reaches the bay of Santa Cruz. Various dry streams, which were the affluents of this river, were probably the last remains of the northern drainage before it was all effected by the Leona river—a similar instance to that of the river Coile. When I visited this lake in 1877, there were some lagoons which were dry in 1898. The plateau between the river Santa Cruz and the Coile is more broken than that south of the former, and, following the north of the river, one climbs up this plateau, which is covered with basalt, underneath which appear cretaceous sandstones with horizontal folds — a continuation of those of the south. One then descends by depressions through which runs the present river Shehuen, that rises at the base of the same western plateau, the pedestal of the Pana volcano. Again climbing an isolated portion of the plateau, one descends into the true valley of the Shehuen, another depression corresponding to Lake San Martin, which is nothing but the fjord of a large ancient lake. When, in 1877, I followed this valley to descend to the lake, the stream, dry to-day, was partly filled with water. When it has any water now, through snow melting on the lateral plateaus, it runs eastward a little way; but it now seems that it does not reach the river Shehuen, the greater part going westward to the Tar lagoon, which empties into Lake San Martin—another phenomenon of capture, perhaps more interesting than that of the Viscachas, which changes the waterparting of a continent. The Tar lagoon is a remnant of the ancient extension of Lake San Martin, which goes on disappearing, and is found in a plain between the moraines left by the old glacier. Judging by Viedma's account, at the close of the last century a drainage-basin

existed to the east, as the natives stated that the Shehuen (or Chalia) river proceeded from a lake. The Kochait mountain—a porphyry boss, the layers which covered it having completely disappeared—gives a picturesque aspect to the scene, which is varied to the west, monotonous to the east. Through beautiful fields, the bed of ancient lagoons, like Tar, dry to-day, surrounded by moraines, and then through a succession of lines of these, —one arrives at Lake San Martin, the eastern part of which is much smaller than that of Lakes Viedma and Argentino, but the fjords thereof seem to be longer. On the south and east it is enclosed by glaciers between high mountains, but on the north it was impossible to reach its end, owing to the storms which overtook us during the ex-



RAPID IN THE RIVER LAS HERAS

pedition, which also prevented our examining another arm situated on the east of the principal longitudinal depression. It drains into the Pacific by a river flowing from the end of the southern arm. This river is 150 yards wide, and, after crossing a little lake and forming small waterfalls, runs in a northern direction to Calen inlet, thus forming the river Toro, which flows into the south-eastern arm of the inlet. The great river which the Argentine boat *Golondrina* examined in 1897, and which empties in Eyre sound, descending by a longitudinal depression between the mountains of the central chain, seems to come from a yet unsurveyed lake.

The lake is very picturesque. Its slopes, polished by the ice, partly covered with *Fagus* and *Drimys* woods, and quantities of

Libocedrus of considerable size are seen, and can be profitably exploited when these regions are inhabited, which will be soon, in view of the interest of the Argentine Government in it. Its altitude above the sea is 690 feet, and soundings of 1000 feet have not reached the bottom. When I made my last journey, I followed towards the north, climbing the plateau covered with basaltic lava, and in which craters are very frequent. To the west the lava-streams hide the cretaceous caps, but characteristic fossils are found in its slopes. The centre is a vast lava-field, relatively flat, traversed by streams which generally issue from small lakes, and which empty to the south into an extensive lake enclosed by lava-streams, without any known outlet, called Lake Cardiel, but the ancient channel of which to Rio Chico still exists. Another stream empties to the north into Lake Quiroga, which occupies another volcanic depression of the tableland, also without present outlet, and north of that lake another larger one has its outlet to the river Chico. According to the natives, great salt lakes exist on this plateau. The Andine longitudinal depression continues always to the west, formed here, in part, by the eastern fjord of Lake San Martin. The neo-volcanic lava-streams have formed a ridge between the river Fosiles, which flows into Lake San Martin, and the river Carbon, which flows northwards as an affluent of the Mayer river. The cretaceous rock is denuded in the steep gorges; and more or less important coal-seams are seen in them.

The river Mayer constitutes another instance of the continental water-parting to the east of the Cordillera. Its eastern affluents and the waters forming the river Chico of Santa Cruz, rise in a depression, the remains of an ancient lake, of which two small lagoons are left as vestiges; the outlet thereof on the east is still visible, as are also the distinct levels left by its retiring waters, after stationary periods. I have followed the river until I saw it, voluminous and torrential, enter the first mountain of the Cordillera, but it was impossible for me to see whether it empties into the northern arm of Lake San Martin or runs straight to the west of the central chain towards some of the fjords, visited by the *Golondrina;* but recently it has been explored by my assistants, who discovered that the river empties into the lake San Martin.

The upper basin of the river Mayer is found at a much greater altitude than that of the lakes already named; the interior longitudinal Andine depression must be found more to the west, so that the plateau between the San Martin and it corresponds to a similar topographical type to the Baguales and Vischacas Sierras. The river Chico rises in the plateau near Lake Quiroga, between the lava-streams, at 4070 feet, and bends eastward when it has once reached by a deep ravine an ancient lake, now dry, where, in the same plain, it increases its waters and sends others to the west by an affluent of the river Mayer. The bed of this lake is situated at 1640 feet, and occupied by two small

lagoons, the former communication of which towards the east is perfectly distinct. A little more to the north of the point at which the waters of this basin unite with those from the small glaciers of the adjacent mountains, to form the river Mayer, discovered by Mr. Hatcher in 1897, there falls into it a torrent from the north (1300 feet) which brings it the waters of a series of lakes situated between a ridge which dominates on the west the basin referred to, and which continues to the north up to Lake Belgrano, cut by Lake Burmeister (2740 feet); this lake, in its turn, drains through the Robles stream into the river Belgrano, affluent of the river Chico. The ridge corresponds to that which extends from Lake San Martin between Fosiles river

MARBLE ISLANDS AT THE LAKE BUENOS AIRES.

and the eastern fjord of the same lake. Perhaps the depression where Lakes Nansen and Azara are found corresponds with that fjord. These lakes receive the waters of the beautiful Belgrano lake, which, in its turn, receives those of Lake Volcan, which is close to it. Lake Belgrano, situated at the base of the eastern ridge, emptied, in modern times, to the east, towards the Atlantic, and had a greater extension than is observed in the series of magnificent terraces which are seen in this direction overlooking the river Belgrano, which winds in the valley, to unite with the river Chico. The Tehuelches Indians, when Viedma made his voyage to the lake that bears his name, told him that the Rio Chico flowed from a lake in the Cordillera. Was this lake the Belgrano, or the smaller Lake Bermeister (2740 feet)? I cannot say now. The wide valley of the Rio Chico, the immense quantity of glacial

detritus it contains, and the presence of great erratic boulders, weighing some dozens of tons, which I have seen at its mouth in the bay of Santa Cruz, demonstrate, without leaving any room for doubt, the existence of a great lake in the latter part of the glacial period, of which the present Lakes Volcan, Belgrano, Nansen, and Azara formed a part, which said lake diminished as soon as communication to the south was opened with the present river Mayer. Lake Volcan is situated at 2560 feet, the Belgrano 2495 feet, and the Azara 2395 feet. The latter enters, on the west, a mountain with glaciers, and drains through a violent stream into Lake Nansen (2296 feet), the western arm of which turns more to the west than the others to the main chain, from the glaciers of which it obtains its waters. Here one observes that the mountains diminish in height towards the south, and are probably cut lower down by the waters of the river Mayer, to which the waters of Lake Nansen arrive through a series of rapids. During the examination I made in 1897 in Calen inlet, I found two rivers which drained into the eastern extremities of its two channels, but neither of them had a flow of waters comparable to what I had seen in the river Mayer. Besides, the Rio Coligue, according to a companion, Mr. Lange, who partly ascended it, appears to rise in the mountains, and does not cross the main chain. I have not found in this river Coligue, any pebbles of neovolcanic origin which correspond to the formations on the east of the central chain composed of granite, porphyry, and quartzite; nevertheless, I saw some huemules (*Cervus chilensis*), which indicates the existence of a pass low down between the east and west of the Cordillera, or else a river which traverses it in the vicinity.

The Indians inhabiting the Pacific channels south of Calen inlet hunt the huemul in some valleys at the end of the numerous fjords, which is a proof that low gaps were to be found in the main chain of that part of the Cordillera, or that rivers intersected it.

The huemul is only found to the west of the Cordillera when river-beds or low passes exist, and it is an error to consider it as peculiar to the Chilian fauna. It principally exists in the western intermediary zone, between the table-land and the first rocky hills, it having even been found in the hills in the vicinity of Port Desire on the Atlantic coast.

If one follows the course of the river Belgrano towards the north, one leaves to the east the Patagonian plateau with its raised borders covered with basaltic lavas, and which attains its greatest height in the Mount Belgrano (6560 feet). Short streams rise at the foot of this eminence, and lose themselves in the lagoons between the lavas or in the centre of the country, such as the Olnie, which becomes extinct in an ancient lake-depression some distance to the west of the main road used by the natives in the very lowest part, where a temporary lagoon still exists. The small gap which separates the waters of the Belgrano on the west from the edge of the raised plateau measures 4920 feet, and, crossing to

the other side, there is another stream descending rapidly towards the north to a lacustrine depression, which, starting in a north-north-west direction, then twists to the west. This depression is the deepest that can be found in Patagonia north of the Lake Maravilla, and is principally occupied by Lake Pueyrredon. The eastern part of the plateau north of Mount Belgrano rapidly decreases in height, and the continental water-parting is situated a good distance to the east. The saline lake, nearly dry to-day, which exists there has an altitude of only 345 feet above sea-level, and is the remains of an ancient, more extensive lake; for Lake Posadas, separated from the said lagoon by a glacial drift, measures 400 feet, whilst Lake Pueyrredon, into which it flows, is scarcely 295 feet above sea-level. I have crossed the region some tens of miles to the east, and my attention was directed to the deep and extensive depression in which runs the intermittent stream, called Gio, and it would not be surprising if it corresponded to a very inferior level, and that this may be less than 330 feet above the sea. Unfortunately, when I was there I had not sufficient time to observe them. It cannot be said to-day whither the cavity of the saline lake extends, descending towards the centre of the valley, connecting itself with the actual depression of the river Gio; but, undoubtedly, it forms a part of the same transversal depression which stretches to the Atlantic to the south of Port Desire, and similar to those already mentioned. The southern cliff of the plateau falls almost vertically about 1600 feet down to the depression, whilst on the north it gently rises up to an isolated porphyritic mountain, which is visible from a long distance — Mount Colorado (4600 feet), at the base of which lies the Gio lagoon (1000 feet), fed by an important stream which runs from the west, and then, after descending, from the north, and rising at an altitude of 4625 feet.

The waters of Lake Gio lose themselves in the vicinity of its outlet and in the low plain which extends to the east, and to the east of the saline lake are other smaller lagoons and pools, whose waters do not reach the plain where it is crossed by the general road to the north. Lake Pueyrredon, an ancient tributary of the Atlantic, now empties itself into the river Las Heras by the west, after receiving the waters of Lake Brown, situated slightly more to the west of its centre. A little to the south of Lake Brown a river rises which flows west, and receives its waters from glaciers which also give rise to the river Lacteo, an affluent of Lake Belgrano, and to the west of Lake Brown there are other lakes still unsurveyed.

My assistants, overtaken by the snow, could not reach last year the end of Lake Pueyrredon, nor see, consequently, its outlet; but I have just received news from them, telling me that it empties by a short river into the river Las Heras, an important torrential river, as great or even more voluminous than the river Palena, situated more to the north. During my examination of Calen inlet, I discovered in the north-eastern

arm a river of great volume and depth, descending from the north, but with such a strong current that it was impossible to row against it, and undoubtedly this river is the outlet of the network of lakes situated to the north of Lake Belgrano, and to the east of the main chain of the Cordillera. I do not think this drainage is effected by any unknown river which may empty into one of the bays—Boca de Canales, Jesuit inlet, or Kelly bay. Another important river falls into the northern arm of the Calen inlet, and an enormous glacier is seen there which extends a great distance in this direction; whilst from the west, fed by great glaciers of the eastern slope of the main chain of the Cordillera, an affluent reaches the great river Las Heras, which is the outlet of Lakes Buenos Aires, Soler, the river Tamango, Lake Pueyrredon, etc. The river Tamango has its source in the immediate vicinities of that of the principal affluent of Lake Gio, and flows to the river Las Heras through another transverse depression, towards the west, a short distance north of Lake Pueyrredon.

The gorge of the affluent of the Gio, passing an opening in the plateau (4625 metres), continues towards the north by that of the river Jeinemeni, which, after receiving an affluent rising in a small lake at 2395 feet, empties into Lake Buenos Aires, the largest in Patagonia. Almost parallel with this river runs the one called De los Antiguos, owing to the native remains which are found there, and which correspond to races which no longer live in Patagonia, as I have ascertained after examination of some of their remains. The region between Rio Gio and Lake Buenos Aires is the most dreary that I know in Patagonia, and also the most sterile; it is covered with large lava-deposits from craters which are scattered over the fragmentary elevated plateau. The affluents of the river Desire, which I have crossed, have their sources there. There is nothing more desolate than this landscape, despite the vivid colouring imparted by the tertiary caps burnt by lava, rich in vertebrate remains, and overthrown from their primitive position by the subsidences which a central longitudinal depression has produced, and which follows the route bordered on the east and west by high plateaux capped with basalt. The contrast between the landscape at the foot of pre-Andine mountains and that of the main road across the table-land is worthy of remark. To the west, bubbling, crystalline streams run between the rocks and the forest, making the passage difficult,—the swamps and the abrupt mountains; to the east, a despairing monotony, always the black basalt line, the small bushes and shrubs—when there are any—and the glittering of broken pieces of obsidian which the gravel frequently contains; bare white and yellow cliffs, black wall, or white beds of dried-up lagoons, and here and there a large erratic boulder where the guanaco is hunted. The sole distraction for the traveller in those uninhabited regions are the ostriches and the guanacos. The Olnie rivulet waters the ancient district of the Tehuelches—"Olnie

aiken" = "where there is grease," a favourite hunting-ground, the reputation of which has been handed down by tradition. The natives say that there was much more water there previously; that one of its largest lagoons, dry to-day, was always filled; and that they could camp in any part of the wide lost valley, which is not the case to-day.

This route, between Lake Belgrano and Lake Buenos Aires, is interesting because it demonstrates the ancient distribution of waters in Patagonia and their subsidence. The same number of terraces can generally be counted from the main surface of the plateau: five important ones 165 feet in height more or less; and four varying from 65 feet to 20 feet, as though the causes which brought about the disappearance of the great lost lakes and rivers had been produced contemporaneously. Likewise this part, better than any other, confirms the opinion, already generally accepted, that Patagonia was covered by an extensive ice-cap, at least as far as the present coasts. The great granitic and quartziferous erratic boulders which proceed from the main chain of the Cordillera prove this, and when once the ice disappeared, the climatic conditions permitted the permanent existence of great rivers and lakes which eroded the surface, which was gradually uplifted. It is indubitable that a great portion of the lavas which are seen on the plateau to-day were deposited prior to the glacial period, but it is also certain that the eruptions have continued up to relatively very recent times, as, in some points, not the slightest vestige of erosion can be noticed on its surface, whilst at others it is polished and striated by the ice.

(*To be continued.*)

ROAD-MAKING AND SURVEYING IN BRITISH EAST AFRICA.*

By Captain G. E. SMITH, R.E

On May 6, 1895, I received orders to proceed forthwith to Zanzibar, to assist the late Captain B. L. Sclater, R.E., in the completion of a road from Mombasa to the shores of the Victoria Nyanza, in order to improve the communications between Uganda and the coast. It was to be a continuation of the "Mackinnon road," which had previously been made by Mr. Wilson under the Imperial British East Africa Company as far as Kibwezi, a distance of 180 miles from Mombasa, and was to be of the simplest kind, unmetalled, and, in fact, the roughest track along which a bullock-cart would go. Captain Sclater, who had previously had two years' experience of rough road-making in Nyasaland (British Central Africa), remained in England to collect the necessary stores for the expedition, while I went out in advance to organize the caravan.

On June 2, 1895, I reached Zanzibar, where I found more than usual

* Read at the Royal Geographical Society, June 26, 1899 Map, p. 352.

difficulty in getting porters, as several large caravans were on the point of starting. It was not until the middle of July that we could collect one hundred men, sufficient for my first start. Captain Sclater, who had arrived at Mombasa in June, remained at the coast to organize other caravans, the last of which did not leave until October, when our caravan became approximately as follows:—

Europeans: in command, the late Captain B. L. Sclater, R.E.; second, Lieut. G. E. Smith, R.E.; assistants, four non-commissioned officers R.E. Indian coolies from Karachi, 100 Swahilis, 100 Askaris, 200 porters. Zulus, 6 bullock-drivers. Up-country natives, from 300 to 500.

We took with us twenty bullock-carts, and had considerable numbers of oxen, donkeys, cows, calves, sheep, goats, etc., besides seven ponies for our own use. The bullock-carts we employed were built at the Royal Arsenal, Woolwich, with two wheels and a pole. They were light and handy, and were usually drawn by three yoke of oxen. Their wheels were so well made that after two years' hard wear we had not broken a single one. They would carry about 1500 lbs.

On July 17, 1895, I started from the coast with our first caravan, with the object of forming a depôt and beginning the road, whilst Captain Sclater from the coast was to organize fresh caravans and start them off up country. Until October I was in advance, prospecting and beginning the road; afterwards Captain Sclater was usually on ahead, and I was finishing up the work behind. It was seldom that our men were all together; indeed, usually we had several camps, each with a white man in charge of it, working at various sections of the road or at the bridges that we built. I have not space to describe such arrangements in detail, nor would a description of all our marches and countermarches be of interest to any one save myself. Briefly I may remark that in two years I shifted camp about three hundred and twenty times, and marched some 5000 miles, which earned me the Swahili sobriquet of "Bwana Kongoni," or hartebeast, because they said I ran about so much.

The late Captain Sclater was anxious, if possible, to make a good map of the country, and the map-making fell to my lot. For the most part I did it in my spare time, taking a day or two, when I could get away from the supervision of the road, for ascending suitable peaks to obtain my trigonometrical observations, whilst my plane-table work or detail was put in as occasion served on the line of march. I had the very great advantage of going several times over most of the country, so that I could work in my detail gradually, first getting in the more conspicuous hills, and afterwards filling in the minor features. This allowed me to get much more accurate results than if I had had to work in everything as I went along the first time, and gave the opportunity of thoroughly testing my work and making corrections where necessary. The Swahilis, who seldom lose the chance of inventing a nickname, also

called me "Bwana Panda Mlima," or "the hill-climber," from the number of hills which we ascended for trigonometrical work.

For the first 180 miles, that is, as far as Kibwezi, the road runs through an uninteresting country, covered with dense thorn scrub and badly supplied with water, the march through the Taru desert being the worst in that respect. Fortunately for us, Mr. Wilson had already made this section of the road; and now the traveller is still more fortunate in being able to pass through this inhospitable country in the train. The land rises sharply in the first 20 miles to a height of nearly 1000 feet, and afterwards more gradually to Kibwezi, which is about 3000 feet above the sea. At Kibwezi our work began with a stiff bit of jungle-cutting over a very rough bit of lava, a couple of miles of graded road over the southern spurs of the Mbinzau hills, and a few miles of bush-cutting, which brought us fairly out on to the Kiboko plains. Up to this point the country is unsuited to cattle, and before the railway reached Kibwezi, many were lost in running transport through this section. The tsetse fly is found at various places, especially near Kibwezi, but I think most of the loss was due to the poor quality and scarcity of the grass and the difficulty of finding sufficient water.

Once the Kiboko plains are reached the country becomes much easier. For our purposes no work was required on the open grass country, with the exception of making a few "drifts" or fords over the rivers to be crossed, which, as it happened, were met at suitable distances for camping. After driving a caravan of carts three or four times across these plains the trail became well marked, and, except in very heavy rain, was good going. Game was abundant, large herds of zebra, hartebeast, wildebeast, and various species of antelope being met with. From one little hill I saw 3000 head of all sorts, including rhinoceros and giraffe.

A good deal has been written of late with regard to preserving the big game of Africa by people who forget that there is another side to the question. Whilst I was in the country where rhinoceros were most common, I lost one man killed and one badly wounded, who had not in either case attacked the rhinoceros. Whilst quietly marching through thick bush, I have had rhinoceros charge suddenly out of it three times. Similar experiences often occurred to other members of the expedition. One of them was knocked down by the shoulder of the animal charging down a narrow path. More than once, when crossing the open plains, I have fired bullets wide of a rhinoceros to drive him off from our track, and have been obliged in the end to kill him because I was not prepared to take the risk of his charging my caravan. A rhinoceros is a thick-skinned animal, and will not take a hint. The elephant is sometimes dangerous without being attacked; but any traveller who has seen the havoc caused by a herd of elephants in a native plantation will understand the joy of the natives when they are killed.

About 50 miles beyond Kibwezi the road reaches Muani, where we

built our first depôt. It is at the foot of the Ukamba hills, about 4600 feet above the sea, and near a good stream. The Wakamba were soon persuaded to bring in food, and we started a thriving trade. I may remind my audience that money in that country was non-existent, unless the various kinds of trade goods, such as calico, beads, brass wire, iron wire, etc., may be called money. Trade is by no means simple. The demand varies from place to place and from time to time, and therefore trade goods have to be designed to satisfy varying needs. Considerable difficulty may be caused if the traveller has not the right sort of calico, of which there were about ten kinds, or of beads, of which we carried nine kinds, or of the other trade goods. And the question is further complicated by the fact that each commodity of trade has an enhanced value for every mile's journey from the coast. When I add that for months after our final start we were unable to get any loads forwarded to us from the coast, owing to the insurrection of Mbaruk and other causes, some of the difficulties of barter and transport may be understood.

Muani may be said to be the beginning of the healthy country, beyond which fever is practically unknown till Kavirondo is reached. The air is cool and bracing, and extraordinarily clear. The sun does not feel excessively hot, and the nights are pleasantly cold.

After 12 miles more of easy work the country rises sharply to the Athi plains. A height of nearly 1000 feet has to be climbed in the next march, making the altitude above the sea over 6000 feet. The road hereabouts was troublesome to locate, as there were so many alternative routes, and I had to examine a good deal of country before coming to a conclusion. In this section we made a graded road, which entailed much earth-work. For the style of unmetalled road we were making, we used, in climbing hills, to endeavour not to exceed a gradient of 1 : 20, or about 3°; but we did not hesitate to put in a bit of 1 : 15, or even steeper, if we saved much work or distance thereby. A new-comer seldom realizes that for a bullock-cart, especially if the drivers are unskilled, a sharp turn on a gradient is much the worst fault in a road. Bullocks must have a straight pull, and you must allow sufficient width at the turns for a caravan to double-team their carts in going up steep or long hills.

A hundred yards or more of 1 : 8 gradient is less objectionable than a couple of sharp turns. If South African waggons are to be used, much easier curves are necessary, unless, of course, they are fully compensated. We saved some work by making the grades for a cart going down country steeper than for one going inland; for the latter is, as a rule, the heavier laden. When we were laying out the road in hilly country, we were careful to grade it well. We had to do a good deal of earth-work in such cases, and should it ever be advisable to improve the road, all the work we did would help; whereas if a road is badly

located, an entirely new road would have to be laid out in order to improve it.

By the end of 1895 we had completed the road to the Athi plains, and in another month it was open as far as Kikuyu. The Athi plains required but little work beyond drifting the rivers, when once the best route across them was decided on. We did not pass through Machako's, the capital of Ukamba, but left it one march to the right. Mr. Ainsworth, the sub-commissioner, has since connected it to the Sclater road by a branch road.

Kikuyu became our headquarters in the early months of 1896, and remained during the rest of our expedition the advanced base from which we drew our supplies for many months. It is a delightful country, from 6500 to 8000 feet above the sea, with a pleasant healthy climate, and with plentiful supplies of food. It is well watered, and has a rich soil. Originally the whole country was forest. The Wakikuyu cleared the middle of the forest for their plantations and villages, and left a thick belt to protect them from their dreaded enemy, the Masai. Timber is still plentiful, but, owing to the more peaceful times which have been established under British rule, they are now rapidly cutting down the forest that remains, as they prefer the newly cleared land for their plantations. The Kikuyu country lies along a line of heights running in a north and south direction, and inhabited chiefly on the eastern side, which slopes gently to the basin of the Athi river and the headwaters of the Tana. To the west the land drops steeply, a fall of 2000 feet, to the Great Rift valley, which extends as a trough-shaped depression north and south for several hundred miles. It has a separate water-system of lakes or marshes with no outlet, fed by rivers of no great length rising in the high mountains on either side. At intervals volcanoes of recent geological times are seen along it, and the floor of the valley is for the most part formed of lava or basalt, and hot springs and steam-jets are not uncommon. Its eastern wall is known as the Kikuyu escarpment, and here we found our heaviest bit of work.

From Fort Smith the road passes through a hilly country with some forest for about 14 miles, until the edge of the escarpment is reached. We had been warned by everybody we had met of the dangers of this bit of road, owing to the irreconcilable Waguruguru, who had an unpleasant habit of cutting up stragglers from caravans in that part, and with whom a constant petty warfare had been waged by the garrison of Fort Smith. Captain Sclater took half a dozen Askaris and boldly went into their country to try and get on terms with them. They turned out in hundreds, spoiling for a fight, but Sclater succeeded in explaining that he had come to shoot hippopotamus and to buy food and make friends. After a short hesitation, they conducted him to a swamp, and gave him every assistance in showing him how to get near the game. By the time he had shot at two or three hippopotamus they

were all good friends, and apparently had come to the conclusion that the Englishman was not such a bad kind of person after all. Captain Sclater had a wonderful knack of making friends with natives. In the course of the next few months I bought about 170,000 lbs. of food from them, and became a blood brother of the leading chiefs. The only trouble was that their friendship became a trifle embarrassing, as the same men who had previously made the road dangerous for all small parties felt hurt when I refused to go and live among them for the rest of my life.

At about 14 miles from Fort Smith we reached the top of the main Kikuyu escarpment, the descent of which to the Kedong river employed 300 men for about four months. For 300 yards in one place we had to blast our road out of the face of a cliff of hard grey crystalline lava. The outer portions we could displace with crowbars and levers, but as we worked into the side of the hill we had to blast. We used about 130 lbs. of dynamite and about 50 lbs. of powder. It was amusing to watch the intense interest of the natives in what they called the white man's witchcraft, the Wakikuyu being especially pleased by watching a large rock bounding down the mountains; whilst the Masai greeted that or the explosion of the blasting charges by exclaiming, "Eigh! eigh! eigh! eigh! Ngai!"

For about 30 miles from the Kedong river to Naivasha lake, little work, except some clearing of bush, was required, but at the north end of the lake the two rivers Morendat and Gilgil had to be bridged. We built simple trestle bridges over them. This took some time, as we had to cut our timber in the juniper forests which clothe that part of the escarpment, and to cart it several miles. The Morendat bridge was 120 feet long, with a 15-feet roadway supported on five framed trestles, whilst the Gilgil bridge was 35 feet long. Both these rivers are liable to prolonged floods, so that drifts would not have been reliable.

One march beyond the Gilgil river we had some heavy earth-work in descending towards Lake Elmuteita, another small independent lake beautifully situated close under the Subugo Rongai hills, which falls in terraces towards it. Three marches further on we had to bridge the Molo river, which, although usually an inconsiderable stream, is unfordable for a month at a time during the rains. Two marches more bring the traveller to the Eldoma ravine and fort. The last march required some earth-work in climbing the foothills of the Mau escarpment, and a minor bridge; but from the Kedong river to the ravine the road crosses plains, and required little work except what I have mentioned.

The bridges which we built were designed to carry a load of 3 tons, the trestles being strong enough to support much more, so that by putting in more road-bearers they could easily be strengthened to carry loads of 10 tons, if it were ever necessary.

Whilst we were busy on this section of road, a lion attacked one of our camps, and was killed by our men. The Masai identified it as a man-eater, which they said had killed a hundred of them. However that may be, he was exceedingly fat; and as it happened that we had at that time run out of cart-grease, we boiled down his carcase and obtained about 70 lbs. of fat. He kept our carts well greased for about six weeks.

Beyond the Eldoma ravine we reached the ascent to the high tableland called the Mau plateau, which forms the watershed between the rivers flowing westwards to the Victoria Nyanza, and so feeding the Nile, and those which flow eastward into the water-system of the Great Rift valley of Masailand. From the Eldoma ravine, 7200 feet above the sea, the eastern slopes rise to a summit-level of about 9500 feet in a distance of 15 miles. They are clothed with thick forest, the lower portion consisting of very large trees of juniper and other kinds which furnish good timber, whilst a dense undergrowth of very tough brushwood makes road-making a difficult and tiresome operation. The upper slopes are somewhat easier, as the forest gives way to open grass-land, intersected by belts of thick bamboo jungle on the higher levels. The old caravan road, which was in use till the autumn of 1896, leaving the Ravine fort, often called by the Swahili word "Shimoni," crossed at once the great ravine of Eldoma, and, plunging into the dense forests I have described, passed north-westwards to the headwaters of the Nolosogelli river. There changing its direction to south-south-west, it follows the left bank as far as Mumia's, where the river is called the Guaso Masa.

This section from the Ravine fort to Mumia's in Kavirondo was notorious for the large losses incurred by caravans. Losses of three or four per cent. were not unknown, whilst it was rare for caravans to get through without casualty. It was eleven marches from the ravine to Mumia's; and until Kabras was reached at the eighth march, no supplies—except perhaps game—could be obtained. Even in fine, dry weather the marches were arduous, and the nights on the top of the Mau very cold; but during the rains, which in that part often continue for many months, the road was dreadful. Through the forest in the ascent of the Mau (three marches) the road was steep, winding, and narrow, and thick undergrowth which had never been properly cleared allowed insufficient headroom for loaded men, and so added immensely to their fatigue. After passing the watershed, the road, although through more open country, was still very bad, as marshes had often to be crossed which were at times deep. At the Eldoma ravine, food used to be issued to each man to last him as far as Mumia's. Experienced porters would make this last out; but the improvident, of whom there are usually many in a Swahili caravan, would often have finished their rations when hardly halfway across the uninhabited region; then, unless the caravan

leaders were skilled hunters, the weaker men perished miserably. The truth, as I have endeavoured to describe it, was sufficiently bad, but various sensational and exaggerated accounts have been published from time to time. A skilled caravan leader could reduce the casualties by taking care that the porters did not sell their blankets or waste their food, and the sacrifice of a load might save a life; but no care could prevent dysentery and pneumonia from attacking the weaker men on the inclement uplands of the Mau.

When I asked one of my headmen what he thought of the road across the Mau, he replied, "Why, sir, the Mau is nothing now; there is no mountain to climb any longer." Allowing for flattery, this shows that the natives appreciate a graded road. One distinguished officer estimated the saving of life caused by it as three or four men per month. From May to November, 1896, we had from two to five hundred men working in this region, of whom we lost but one; and as his death was probably due to heart disease, our loss through climate was *nil*. This I attribute chiefly to the issue of an increased ration to our men, which we were able to afford, owing to the efficiency of our cart transport. We had a further advantage, owing to the fact that, never having large numbers of men far away from the advanced end of our road, we could continually fill stores with food near to our working parties, and issue it every few days, thus reducing to a minimum the ill effects of improvidence among the porters. Furthermore, if a man became ill, we could transport him in carts to a less inclement climate.

Our orders were to make the road by Eldoma Ravine fort and Mumia's to Port Victoria. It had been thought until 1895 that the Eldoma ravine could not be avoided by either road or railway. It is a serious obstacle, 300 feet deep, with sides which are for the most part precipitous and nowhere of less slope than 1 : 1. Mr. Martin, when he was in charge of the Ravine fort, however, found an easy way to avoid it; and in 1896 Captain Sclater, making a more exhaustive examination of the country, discovered a direct route round the ravine to Mumia's by the Nandi country, which had been practically unknown until Major Cunningham's punitive expedition to it early in 1896. This country, being covered with thick forest and intersected by minor features, was a very difficult one in which to lay out a road; but Captain Sclater, after much labour, laid out an excellent line up a main spur, hitting off very skilfully those parts of the country where bare patches relieved us of the necessity of clearing forest. With a ruling gradient of about 1 : 20, the summit-level of the Mau plateau is reached in about 15 miles, of which two-thirds are through thick forest. From the summit-level the country is more open, and only occasional belts of forest are crossed as the road gradually descends into the Nandi country. Four minor rivers had to be bridged in this section; but as plenty of magnificent timber was at hand, this was a simple matter, and each bridge was a single

span of from 20 to 30 feet. The piers on either side were built of rough timber crib-work, pinned at the angles with 2-inch trenails of hard wood, driven home through auger-holes. The road-bearers were of large timbers, with a rough roadway fixed in a similar way.

Nandi is now reached in four or five marches from the ravine. It is a charming country lying between 6000 and 7000 feet above the sea. It is chiefly pasture of good turf, and the natives live by their flocks of goats and fat-tailed sheep and herds of humped cattle, which are here of a larger breed than any other I have seen in East Africa. They also cultivate millet and other native cereals to a small extent. It is a country of hills and valleys innumerable; in every valley is a clear stream rushing over a rocky bed. In Nandi itself you could camp at any moment, and be sure of water in the nearest hollow. The Wanandi are akin to the Masai both in language, race, and habits, and, like the latter, used to raid their weaker neighbours extensively. They do not much like being kept in order by an Englishman in the midst of them, and are not to be entirely trusted yet—at any rate, at a distance from the caravan road. A fort was built at Kamsikak, and was garrisoned by some of the Nubians, who have since mutinied. We reached Nandi in October, 1896, although we had not finished all our bridges until somewhat later.

Nandi occupies a plateau, which is sharply defined towards the south and west by what is generally known as the Nandi escarpment. To the south this is a formidable obstacle, as the land drops very steeply some 2500 feet. Fortunately for us, to the west the fall is less abrupt, although the forest which clothes the slopes and foot of the escarpment is thick, and one deep river, the Gimonde, needed bridging. We had about 12 miles of forest to work through, and about 1200 feet to descend, before reaching the open plains of Kavirondo. The Itsuka and two inferior streams had still to be crossed to reach Mumia's fort and station, but otherwise scarcely any further work was required. The bridge over the Itsuka river was the most considerable work, consisting as it did of four 20-foot spans, supported by trestle frames. From lack of carpenters, this bridge could not be finished until January, 1897. Meanwhile Captain Sclater had finished what little clearing work was required up to Mumia's, and, crossing the Guaso Masa river, had driven carts to Port Victoria, on the Victoria Nyanza, on the last day of December, 1896. The Guaso Masa river is liable to heavy and prolonged floods, and, when low, is generally 150 feet wide. To bridge it would have been a considerable work, as no timber of sufficient size could be obtained within 20 miles of Mumia's. We decided, accordingly, to build a ferry-boat suitable for taking carts across.

Early in January, 1897, Captain Sclater started for the coast to begin other work to which he had been appointed, whilst I remained to finish the ferry-boat and to complete the data for my survey as far as

Mumia's. We found Kavirondo by no means so healthy as the higher country between Kikuyu and Nandi, and in this part no European of our party escaped without suffering from more or less severe attacks of boils, or fever, or both. It is a thickly populated country, treeless, and much cultivated. The natives go about without any clothes whatever; both sexes are equally indifferent to them. This is a drawback, as, their only want being a few beads, they have no adequate inducement to work, and it is difficult to persuade them to do so. There is scarcely any game in their country except crocodiles and hippopotamus. The country is chiefly noted for its thunderstorms and hailstones.

The construction of a ferry-boat I found a matter of some difficulty, as I had not a proper supply of stores for the purpose, and, except for a few spikes and nails and some steel wire rope, I had to make or improvise all I wanted. My timber for planks I had to cut 25 miles away and cart to the spot, whilst suitable stuff for knees I obtained in the Mau forest and carted over 100 miles. I had no oakum, no white lead, no pitch, no tar. I had to make my own bolts, and most of my spikes. I even ran short of iron, and had to use native smelted iron for finishing my spikes. I built a kind of punt, 36 feet long, 10 feet wide, with sloping ends and flat bottom. I used old gunny bags and a native fibre called kongi, steeped in cart grease and hippopotamus fat, for caulking the seams. After much labour, we managed to make a ship which floated, and which was certainly of great strength and weight. I adopted a simple method of warping her across the stream, and finished my work at the end of March, when I started for the coast, and, marching hard, I reached Mombasa in the middle of May, 1897.

I found Captain Sclater preparing to start up country again. He was unwell, but, becoming better, determined to proceed. I left Mombasa by the next opportunity, and arrived in England at the end of June, 1897.

Soon afterwards I learned, to my great regret, that Captain Sclater was again very ill with fever. He was ordered home, but it was too late. The day before his ship started, symptoms of hæmaturic fever developed, and he became too ill to travel, and a few days later he died.

Among many men whom I know who are successful in dealing with the African native, I think he was second to none. He made them all love him. His tact and patience with them was inexhaustible, and his cheery manner always seemed to put them into a good temper. His name used to work like magic, and a man who claimed friendship with "Bwana Saleta," as they used to call him, was sure of a friendly reception. In Kavirondo I met with a native bard who used to greet passing caravans with an ode celebrating his praises accompanied on a native guitar.

The "Sclater road" to the Victoria Nyanza lake took about two years to accomplish. It is 400 miles long, and cost about £17,000.

The remainder of my paper is concerned with my survey work; I

cannot, I am afraid, avoid making it rather technical, although I have relegated to appendices the parts which seem to me only to concern specialists.

On leaving the coast in 1895, my object was to endeavour to complete a triangulation over as large a portion of the country as possible, filling in as much detail as I could with the plane-table. I knew that the first 100 miles would be difficult, owing to the jungle which covers it, and I hardly expected to be able to triangulate from Mombasa itself, especially as, until Kibwezi was reached, I knew I could not spare more than a day or two for the purpose. I hoped from Ndi and other mountains to connect my work with the triangulation carried out to the southward of the road by my brother consul C. S. Smith and myself whilst engaged on the Anglo-German boundary commission in 1893. I had, however, the misfortune to meet with an accident which disabled me for several days, so that I had to be carried, and could not survey. Indirectly my accident, disorganizing for a day or two my caravan, probably encouraged one of my men to desert with his load, which contained my sextant, nautical almanacs, mathematical tables, and other useful books. It was some time before I obtained fresh copies, and, having no almanac, I was prevented from doing any astronomical observations. I afterwards regretted that I did not take sights for azimuth at Mbinzau; but I did not do so, as no sights are satisfactory when not worked out at the time.

I did not succeed in doing any work of value until some time afterwards, and I added nothing to our geographical knowledge until Kibwezi.

The instruments which I used were as follows: One 5-inch transit theodolite, by Troughton & Sims, reading to minutes of arc; one 6-inch sextant by Mr. Porter (late Carey); one artificial horizon; two plane-tables; aneroid, thermometers, etc.

For the methods of calculation employed, I must refer inquirers to Appendices I., II., and III., and to the 600 pages of foolscap on which the computations are worked out.

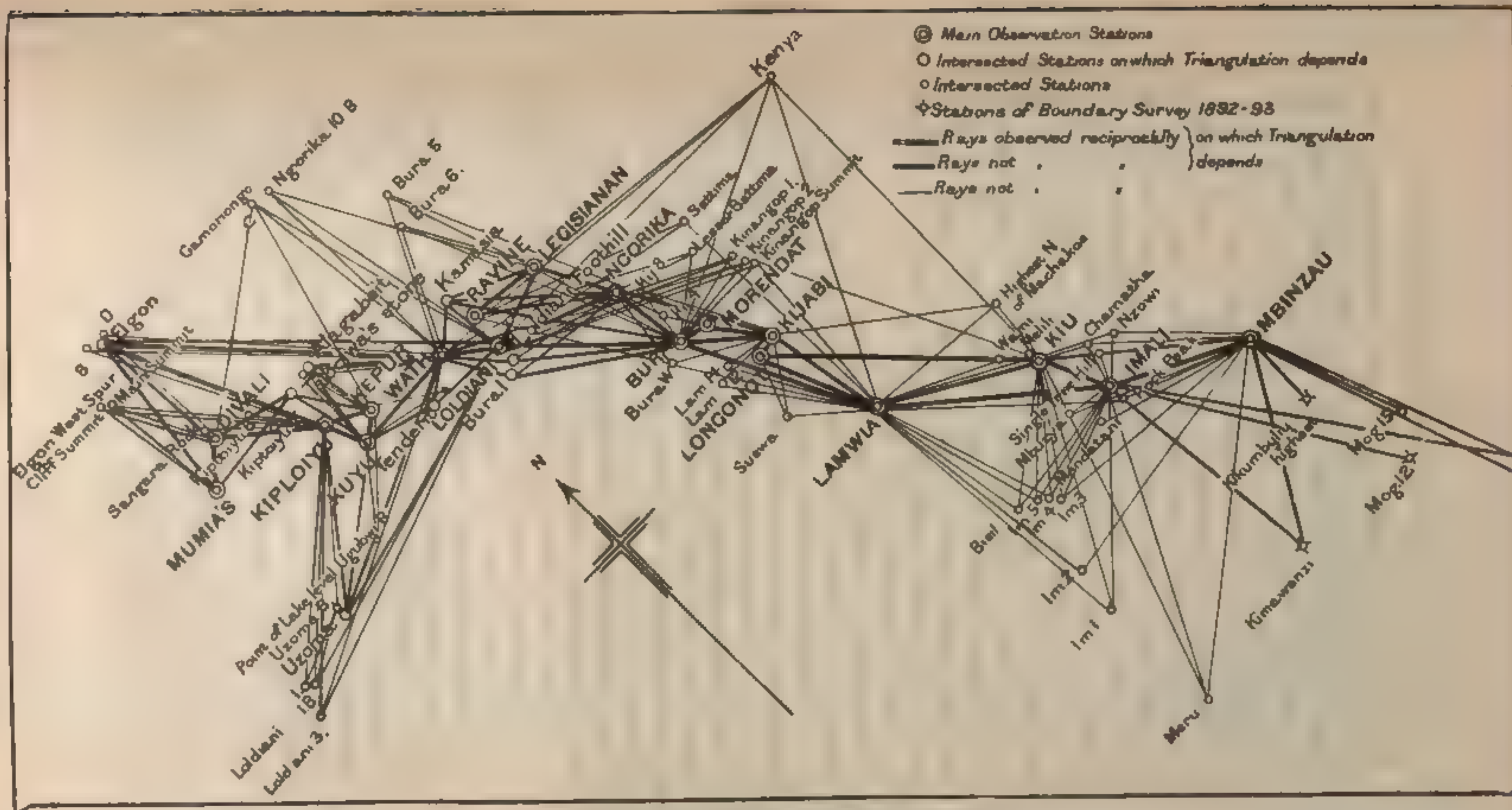
Near Kibwezi a very good peak called Mbinzau rises 1500 feet above the plains, and from its summit I began my triangulation with a set of theodolite angles. Among the peaks I observed were five which I identified as peaks whose position and height had been determined in 1892.* In order to fix my starting-point more accurately than I could do with a plane-table, I employed the method of resection, described in Appendix II., from which it can be seen that I obtain the most probable azimuth and position, and can at once determine the probable error of the result. The latter can only be looked on as a rough guide, as the number of observations (five) is not sufficient to make the theory of

* A sixth was observed with such results as to show the necessity for its revision. It turned out that an error in calculation had been made.

least squares rigidly applicable. In this case my probable error was 48 feet in distance from one of my former points. For the benefit of the unmathematical among my audience, I may explain that where several discrepant results are obtained for the same quantity, by an examination of the errors of the results, a quantity called the probable error can be obtained, which assigns a limit within which it is an even chance that the true result lies. This limit can be computed with precision where a large number of results are obtained; where the number is small, the probable error gives only a rough idea of the accuracy obtained, and in the present paper it is in this sense that my results as to probable error must be understood.

I afterwards obtained a good astronomical azimuth at Lake Naivasha, which gave a discrepancy with my resected azimuth of 3′ 38″. This correction altered the position of Mbinzau 120 feet in latitude and 340 feet in longitude, but my original position was sufficiently near for a first approximation.

About 40 miles beyond Mbinzau I obtained an excellent observation station at Imali, a sharp peak some 2000 feet above the plains at the south-west of the Ukamba country, from which I could again see several old friends. Using the resected azimuth, I cut in my position from them, so obtaining a base which was sufficiently good for a first approximation, and which had only to be slightly altered later on when I could test my scale by latitudes obtained at Naivasha. From this point onwards the work was much simpler, and, as may be seen from the diagram of triangulation, I reached Naivasha with six fairly well-shaped triangles, of which all save the first have all the angles observed. This point, close to the bridge over the Morendat, was a very good place for astronomical work. It is situated in the centre of a small plain about 10 miles across from east to west, and to north and south the mountain masses are more distant and symmetrical—a very important point in getting an accurate latitude, in order to avoid local attraction along the meridian. I observed eight pairs of circummeridian stars, each star being on the average observed ten times, and, combining these 160 individual observations, I obtained a latitude with a probable error of 83 feet, a result which could probably not be much bettered with a 6-inch sextant reading to 10″. I also obtained four pairs of east-and-west star observations of azimuth, which worked out with very small errors. The above gave me the data for arriving at a second approximation with my triangulation. I oriented my triangulation on this azimuth, and corrected my scale so that my triangulated latitude should agree with my observed latitude at Morendat. I now had obtained the second approximation for the latitudes and longitudes of my first seven observation stations. Two more well-shaped triangles brought me to Loldiani, the highest peak in the Mau range of mountains, and also the highest point I ascended—10,000 feet above the sea.



CAPTAIN SMITH'S TRIANGULATION (GREATLY REDUCED).

From Loldiani to Mumia's, which was my final station, I proceed with six observation stations. In only one case was I able to observe three angles of the triangles, but where this could not be done, I solved two or more triangles with two angles observed, in order to obtain reliable checks on my work.

At Mumia's, which is situated in a wide plain, and is probably free from local attraction, I observed very carefully for latitude seven pairs of circummeridian stars with about ten observations for each star. Combining these 140 observations, I obtained a latitude with a probable error of only 96 feet. My sights for azimuth comprised four sets of morning and evening observations of the sun, giving a probable error of 7″. Comparing the above results with those obtained by triangulation, I got an error of azimuth of 1′ 58″, whilst the discrepancy in latitude was only 30 feet. It will be seen from the above that at the three points Mbinzau, Morendat river, and Mumia's, where I can compare my triangulation results with previous work or with astronomical determinations, the residual errors of latitude are practically nil, whilst those of azimuth are not great.

Consequently, we can infer that the orientation of my series of triangles is not far wrong, and that being so, the good agreement in latitude shows that the scale is approximately correct—provided that the triangulation is consistent with itself. This is shown in the early part from Kiu to Loldiani by the accuracy with which Kenya is fixed from four observation points, the probable error in latitude being only 19 feet, whilst in longitude it is 72 feet; and in the latter part by the good agreement obtained in the determination of other outlying points, such as Elgon.

The general accuracy of the map which I claim from these errors, which I have quoted at some length, is as follows:—

(1) All latitudes of main points correct to within 1″, or 100 feet.

(2) Longitudes * correct to 800 feet, or about 8″; errors of longitude, if any, being due to error in azimuth.

(3) Azimuth correct to 1′ of arc.

I claim, however, that the map is consistent with itself, so that if at any future time the longitudes of Mumia's and of Mbinzau be determined by telegraph, the whole of my work may be corrected by a slight change of orientation and scale.

Turning now to my computations of height, I have combined my observations in such a manner as to obtain two independent series from start to finish. One series consists of reciprocally observed vertical

* Longitudes depend on longitudes of the Anglo-German Boundary Commission of 1893, which themselves depend on the longitude assigned to Mount Jombo, near Wanga, in the Admiralty Chart. It is probable that a constant correction may have to be applied to all these longitudes on the computation of any one of them by telegraph.

angles throughout, whilst the other is equally complete as far as Loldiani, although beyond it depends on intersected points, of which in every case two or more are taken. These two series are equivalent to a single series of over 600 miles, closing on the same point. The closing error was only 25·5 feet, a surprisingly good result with a 5-inch theodolite. I used the methods employed in the Indian survey, and a good idea is formed of the regularity of the results * by examining the co-efficients of refraction which I obtained from each pair of reciprocally observed angles, and which are nearly constant until the main watershed of the Mau are past, whilst afterwards they regularly increased in value to my final station. Perhaps the points of most general interest in my results are some of the determinations of height which I obtained. I have already referred to the position of Kenya † and its small probable errors. I now wish to point out that its height has been considerably exaggerated. I have worked it out from six different positions, and with a probable error of 19 feet I assign to it a height of 17,180 feet.

The next highest peak which I observed was Donyu Elgon, or Elgoin, north of Mumia's, which I found to have an altitude of 14,200 feet, with a probable error of 20 feet. This confirms the result of Lieut.-Colonel Macdonald in 1892, when the Uganda railway survey, no doubt giving round numbers, gave it a height of 14,000 feet.

I will now draw your attention to two mountains of considerable height which have been called by various names, and to one of which existence even has been denied by a distinguished geologist. They are vaguely marked on most maps as the "Aberdare range," although they have more than one excellent native name of their own. Sattima rises to a height of 13,390 feet, whilst Kinangop, or Donyu Ronyu, is 12,920 feet above the sea.‡ It seems hard on two such giants that they should have been ignored; but, although I saw and observed them many times, they are often sulky, hiding themselves in cloud for a month at a time, and from many places near to them are always hidden by intervening hills.

My determination for the height of the Victoria Nyanza was 3775 feet, which again corroborated the railway survey result of 3820 feet.

Concurrently with my trigonometrical and astronomical work, I carried on a plane-table survey on a scale of about 2 miles to the inch, which I had the opportunity of checking many times. As I could not work out my triangulation until afterwards, I had to work my plane-table independently from sheet to sheet. I began each sheet by

* As follows: $\frac{r''}{c''}$ = 0·065, 0·059, 0·060, 0·058, 0·060, 0·063, 0·066, 0·076, 0·075, 0·077, 0·079, 0·088, 0·091, 0·093, where r'' = angular refraction correction in seconds, c'' = distance in seconds of arc.

† Lat. 0° 9′ 13″·1 S., long. 37° 18′ 37″·2 E.; height, 17,180 feet.

‡ Sattima, lat. 0° 18′ 53″ S., long. 36° 37′ 38″ E.; Kinangop, lat. 0° 37′ 48·4″ S., long. 36° 42′ 29″.

transferring two points only, which I used as a base, so that each sheet is consistent with itself, and when re-drawn on the triangulated points most of the error disappears. I have used the Geographical Society's system of spelling throughout. I also, for purposes of reference, started a diagram of triangulation in the field on a scale of 8 miles to the inch, which saved me much labour in arriving at first approximations, forming a useful check and helping to identify distant mountains.

A good deal has appeared in the papers lately about the change of route which has been adopted for the Uganda railway, and perhaps a few remarks on the subject would not be out of place. A glance at the map will show that the originally proposed route by Eldoma ravine, Mumia's, and Port Victoria went a very long way round, and that, if a way could be found striking straight for the lake from Lake Nakuru, much distance would be saved. Captain Sclater was tied down by orders to take the road by Eldoma ravine and Mumia's; but although he was not able to see all the country, he expected that the direct route would prove easier. Whilst I was surveying in that part from various lofty hills, I saw very nearly all the country concerned, and was convinced that there lay the best route for the railway. I believe I was the first to get a fair map of the district, and our representations convinced Mr. Whitehouse, the chief engineer of the Uganda railway, that the route, which will save some half-million sterling, was worth a detailed survey. It is not generally known that Lieut.-Colonel Macdonald in '93 intended to return by this route, but was prevented by adverse circumstances.

With the exception that I obtained occasional assistance in time-taking for astronomical sights from other gentlemen, I did the whole of this survey unaided, nearly all of it in my spare time. It cost under £100. It will shortly be published by the Intelligence Department, War Office, on a scale of 1 : 250,000, or nearly 4 miles to the inch, with other work incorporated with it.

I cannot close a paper on East Africa without acknowledging heartily the hospitality and unfailing kindness of the various Government officials stationed in the Uganda and Coast Protectorate whom I have met, and wishing them every success in the somewhat lonely life which they have selected.

APPENDIX I.

Indian System of Computation.

'The Auxiliary Tables to facilitate the Calculations of the Indian Survey,' 1887, is the work employed. The formulæ used in computing are given as "Alternative Method in Secondary Triangulation," pp. 69 *et seq.*, and are more than sufficiently accurate for the instruments that I employed.

The following symbols are employed :—

λ = latitude of point A.
L = longitude „
A = azimuth of B from A, measured from south clockwise.
$\lambda + \Delta\lambda$ = latitude of B.
$L + \Delta L$ = longitude of B.
$\pi + A + \Delta A$ = azimuth of A from B.
c = distance AB.
ρ = radius of curvature of meridian.
ν = normal, terminated at minor axis.

$$\text{Then } \Delta\lambda = -\frac{c}{\rho}\cos\left(A + \frac{\Delta A}{2}\right)\operatorname{cosec} 1'' \quad . \quad . \quad . \quad (1)$$

$$\Delta L = -\frac{c}{r}\frac{\sin\left(A + \frac{\Delta A}{2}\right)}{\cos\left(\lambda + \frac{\Delta\lambda}{2}\right)}\operatorname{cosec} 1'' \quad . \quad . \quad . \quad (2)$$

$$\frac{\Delta A}{2} = \frac{\Delta L}{2}\sin\left(\lambda + \frac{\Delta\lambda}{2}\right) \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (3)$$

$$\log\frac{\operatorname{cosec} 1''}{\rho} = \text{colog (Table XXVI.)}$$

$$\text{and } \log\frac{\operatorname{cosec} 1''}{\nu\cos\left(\lambda + \frac{\Delta\lambda}{2}\right)} = \text{colog (Table XXVII.)}$$

These equations lead to very simple computations. I allowed for spherical excess in the larger triangles, although it was hardly worth while using Table IV. for the purpose. The computations for heights are given on pp. 24 to 30. I may remark that the coefficient of refraction alluded to in the text is the quantity $\frac{r''}{c''}$, where r'' = refraction in vertical angle at A or B in seconds, and c'' = contained arc of Earth's surface between A and B in seconds.

APPENDIX II.

A method of finding the most probable position of a station from a round of angles to points of known position when the azimuth of all points is only approximately known from a plane-table resection, applying the theory of least squares.

I describe the operations. I do not propose to prove the method.

1. Choose a suitable point (A) of the known points, such that the line joining it to your station (called X) is a common side to all the triangles having XA and each of the other known points at the angles, and such that the triangles are all of fair shape.

2. Then the problem is solved when you determine distance XA and azimuth θ of X from A.

3. Take approximate azimuth θ_1 from plane-table, and solve triangle XAB (BCD . . . being other known points). This gives a value a_1 for distance XA. Recompute triangle XAB with value for azimuth a little greater and a little less than θ_1, which we call θ_2 and θ_3. This will give new values a_2, a_3 for distance XA. Similarly, compute the triangles XAC, XAD, etc., with the azimuths θ_1, θ_2, θ_3, giving values β_1, β_2, β_3, γ_1, γ_2, γ_3, etc , for distance XA.

4. Plot as abscissæ on a suitable scale the azimuths $\theta_1, \theta_2, \theta_3$. Plot also on a suitable scale as ordinates the lengths $a_1, a_2, a_3, \beta_1, \beta_2, \beta_3$, etc. (It is usually more convenient to plot the log distances, which, within the limits required for this purpose, are proportional to the lengths. Then join a_1, a_2, and a_3; this line represents the locus where the ordinates are length XA, abscissæ azimuth θ. Similarly, join $\beta_1, \beta_2, \beta_3$, etc. Find a line of mean values (ordinates being means of respective ordinates of lines a_1, a_2, a_3, etc.). θ is treated as Independent variable.

5. By inspection observe about where the line of mean values differs least from lines a_1, a_2, a_3, etc. Near this point draw several ordinates. On each of these ordinates find the square root of the sum of the squares of the errors of the lines a_1, a_2, a_3, etc., on the line of mean value. (This can easily be done with a pair of compasses.) Plot on each ordinate below the axis of azimuths this length. Join the points so found by a curve, which is the locus of square root of sum of squares of the apparent errors on the mean line. The horizontal tangent to this curve touches it at the point P. Draw the ordinate PQ, cutting line of mean values in the point Q. Then the ordinate and abscissæ of point Q are respectively the distance XA and the azimuth θ when the square root of the sum of the squares of the apparent errors is a minimum. In other words, we have found the most probable distance XA and azimuth θ.

The above process can be repeated on a larger scale, if necessary. This process has the objection that it gives greater weight to one of the points A than it does to any of the others, as that point has been combined with each of the others. This method was only looked upon as giving a better value for my starting-point than I could hope to get with a small-scale plane-table. The value of azimuth obtained at Morendat was the one finally adopted. If the lines a_1, a_2, a_3, and $\beta_1, \beta_2, \beta_3$, etc., are parallel, the problem is indeterminate, A, B, C, D, . . . and X all lying on one circle.

APPENDIX III.

Slide-rule Method of computing Heights.

In surveying operations it is constantly required to find out the difference in height between two hills approximately. For minor points on a small-scale map, you do not wish to go through the labour of the rigid methods. The following method I have found to give results within about 20 feet of the rigid method up to distances of about 20 miles and angles of 1° 20′, within which most of such problems would come. On Cary's ordinary boxwood slide-rule is found a logarithmic scale twice repeated for numbers, and a logarithmic scale of sines (the difference between sines and tangents on such a scale is imperceptible below 3°), from 40′ to 90°. If the scale of sines be enlarged to nearly twice the length, we reach log sine 30″ on the left hand of the scale. To use this in the ordinary way, the scale of numbers has to be repeated five times. The problem is now in this form: Given distance (plain surface) between two points in feet and vertical angle, we get answer difference of height in feet.

But, working with a small-scale plane-table, it is much more convenient to measure off the distance in miles or geographical miles; so that, using such a slide-rule in the ordinary way, you would have to measure off distance in miles, multiply out into feet, and then proceed, using the ordinary zero of sin 90°, or a special scale of feet would be required on each sheet. This complication may be avoided by shifting your zero a suitable distance towards the left on the scale of

sines. The zero for geographical miles comes at log sin 5′ 38″ about. We can now cut off all the scale of log sines to the right of 1° 10′, and, using scale of numbers of ordinary size, we get a compact instrument. From this we can directly solve the problem, given (plain surface) distance in geographical miles, vertical angle between 30″ and 1° 10″, to find height in feet.

Now, since the correction for curvature and refraction in arc is a nearly constant ratio of the contained arc or distance, we can place a mark "K" a suitable distance from our zero, and when the zero is placed opposite the distance, "K" will be opposite the angular correction to the vertical angle. If angles of elevation be taken as positive, and of depression as negative, we have "K" always positive.

Example.— Distance A to B = 12½ geographical miles; vertical angle = −15′ 30″.

Place zero opposite 12½, then K* is opposite 5·4. Then 5′·4 = 5′ 24″ = correction.

$$\begin{aligned} \text{Vertical angle} &= -15' \ 30'' \\ \text{Correction} &= +\ \ 5' \ 24'' \\ \hline \text{Corrected angle} &= -10' \ 6'' \end{aligned}$$

Opposite 10′ 6″ (without shifting slide-rule) will be found 151. *Answer*, B is 151 feet below A.

The above can all be done easily in the head.

APPENDIX IV.

PLOTTING.

I plotted my graticules in the ordinary way from the tables given in Auxiliary Tables Indian Survey. But I soon found that the convergency of the meridians was so small for latitudes of under 2° 30′ that I neglected it altogether, simply using rectangular co-ordinates of the proper length. Such plotting errors are less than that due to the stretch of the paper.

TABLE I.

MAIN TRIANGULATION.

Station.	Latitude.	East Longitude.	Height.
	° ′ ″	° ′ ″	feet.
Mbinzau	2 21 12·7 S.	37 55 6·8	4,590
Imali	2 3 47·5 „	37 22 37·5	6,007
Kiu	1 46 48·9 „	37 15 0·2	6,694
Lamwia	1 25 24·4 „	36 38 18·1	8,177
Longonot	0 55 7·0 „	36 26 47·8	9,224
Kijabi	0 54 39·9 „	36 32 42·1	8,870
Bura	0 38 13·2 „	36 15 51·4	8,857
Morendat	0 40 19·9 „	36 23 25·6	6,362
Ngorika	0 18 24·5 „	36 12 58·0	7,655
Loldiani	0 6 47·7 „	35 43 32·2	10,002
Legisianan	0 1 1·0 N.	36 3 41	6,270
Ravine station... ...	0 2 58·7 „	35 43 59·3	7,239
Wath	0 2 36·2 „	35 31 30·3	9,586
Kuyu	0 1 24·0 „	35 3 51	6,859
Kepur	0 5 44·7 „	35 9 52·4	7,298
Kiptoiyu	0 11 34·5 „	34 59 2·8	6,620
Divali	0 29 26·5 „	34 36 59·4	5,080
Mumia's (east gate of fort)	0 20 14·1 „	34 28 46·3	4,425

* K is computed for a mean coefficient of refraction of 0·075.

TABLE II.

Intersected Points on which Main Triangulation partly depends.

No. of triangles solved.	No. of vertical angles solved.	Name.	Latitude.	East Longitude.	Height.
			° ′ ″	° ′ ″	feet.
1	3	Loldiani foothill	0 9 59·3 S.	35 43 4·3	8,970
3	4	Kamasia	0 10 31·6 N.	35 41 37·9	9,264
1	3	Bura 1	0 12 54·0 S.	35 41 8·2	9,019
2	4	Uzoma	0 23 18·2 S.	34 29 34·1	5,795
1	3	Tenderit *or* Langai	0 4 45·4 S.	35 21 24·0	8,809
1	3	Alagabeit C ...	0 24 55·8 N.	35 6 16·8	6,911
1	3	Tobolwa's stone	0 23 27·9 N.	34 58 26·5	7,170
2	5	Elgon summit ...	1 6 1·6 N.	34 34 15·5	14,197

TABLE III.

Intersected Points.

Computed from: No. of triangles.	Computed from: No. of vertical angles.	Name.	Latitude.	East longitude.	Height.
			° ′ ″	° ′ ″	feet.
4	6	Kenia	0 9 13·1 S.	37 18 37·3	17,184
3	7	Kinangop, or Donyu Ronyu	0 37 48·4 S.	36 42 29·2	12,920
3	3	Suswa	1 10 40 S.	36 20 52	7,840
2	2	Sangara	0 31 17 N.	34 36 8	5,272
2	3	Im. 1	2 42 17 S.	36 42 52	8,730
2	2	Rock peak ...	2 8 34 S.	37 22 48	5,773
2	2	Mb. 2	2 30 1 S.	36 45 1	8,410
2	3	Meru	3 15 9·5 S.	36 44 59	15,122
2	3	Bisil	2 8 28·5 S.	36 45 22	7,056
2	2	Mendatani ...	2 8 9 S.	37 14 26	6,062
2	2	Mbuzya	2 1 0 S.	37 10 18	5,725
2	2	Chamatha ...	1 52 26 S.	37 25 53	6,265
2	2	Single-tree hill	1 55 56 S.	37 26 40	6,011
2	2	Nzowi	1 55 13·5 S.	37 32 52	6,069
2	2	Mb. 3	2 13 22 S.	36 52 53	6,954
2	2	Im. 4	2 12 19 S.	36 51 54	6,946
2	2	Im. 5	2 11 0 S.	36 50 19	6,790
2	2	Wami	1 38 46 S.	37 7 56	6,366
2	2	Malili	1 45 2 S.	37 14 49	6,155
2	2	Highest just north of Machako's	1 29 10 S.	37 17 31	6,978
2	3	Sattima highest	0 18 53 S.	36 37 38	13,391
2	2	Lam. 12	0 53 19 S.	36 16 6	8,073
2	2	Lam. 14	0 51 36 S.	36 19 23	7,768
2	2	Bura West ...	0 39 4 S.	36 11 10	9,374
2	2	Bura central *a* ...	0 38 23 S.	36 14 8	9,433
2	2	Kij 4	0 31 1 S.	36 16 32	7,072
2	2	Eldalat	0 3 31 S.	35 49 43	8,019
2	2	Kinangop 1 ...	0 33 27 S.	36 40 9	11,216
2	2	Kinangop 2 ...	0 34 57 S.	36 40 49	11,420
2	2	Bura 5	0 40 23 N.	35 50 26	8,323
2	3	Ngorika 10 B ...	1 2 40 N.	35 30 36	10,360
2	2	Loldiani 3 ...	0 37 4 S.	34 8 4	7,400
2	2	Loldiani 1 B ...	0 31 17 S.	34 12 39	6,032
2	2	Uzoma B... ...	0 22 19 S.	34 29 32	5,492
2	2	Elgon D	1 7 28 N.	34 35 46	18,880

Computed from: No. of triangles.	Computed from: No. of vertical angles.	Name.	Latitude.	East longitude.	Height.
			° ′ ″	° ′ ″	feet.
2	2	Elgon west spur, main summit	0 54 28 N.	34 24 7	7,835
2	2	Elgon west spur, cliff summit	0 54 56 N.	34 22 38	7,716
2	2	Elgon B	1 7 13 N.	34 31 23	14,080
2	3	Elgon C	1 6 14 N.	34 33 18	14,000
2	4	Gamoriongo C ...	1 3 37 N.	35 24 30	10,312
2	2	Alagabeit highest	0 24 54 N.	35 5 24	7,218
2	2	Alagabeit B ...	0 24 45 N.	35 4 42	7,051
1	1	Kipt 5	0 21 18 N.	34 49 45	5,742
1	1	Kipt 6	0 27 42 N.	34 47 50	5,598
1	2	Bura central B ...	0 38 15 S.	36 13 58	9,413
1	2	Point on Victoria lake. Ugubwi bay	0 16 43 S.	34 47 9	3,775
1	2	Sergoit	0 38 37 N.	35 23 23	7,910

TABLE IV.

MINOR INTERSECTED POINTS. *Positions* OBTAINED BY PLOTTING AZIMUTHS OR FROM PLANE-TABLE; *Heights*, BY SLIDE-RULE METHOD.

Number of vertical angles solved.	Name.	Latitude.	East Longitude.	Height.
		° ′ ″	° ′ ″	feet.
2	Lake Naivasha	—	—	6312
2	Top of half-transome, south end Morendat bridge	—	—	6328
2	Subugo-Kij 8	0 22 10 S.	36 16 30	8502
2	Lesser Sattima	0 25 40 S.	36 32 20	11,174
2	Bura. 6	0 32 0 N.	35 47 15	7,695
2	Loldiani, 1	0 30 45 S.	34 11 55	6,190
2	Mwoititi	0 4 1 S.	35 27 33	8,960
2	Southern Kiu	1 57 5 S.	37 19 40	5,720
2	Woody top	1 59 5 S.	37 28 15	5,561
2	Rhino peak	1 50 35 S.	37 30 8	6,072
2	Donyu Sabuk	1 8 35 S.	37 15 31	7,137
2	Lukenia	1 29 13 S.	37 4 8	6,142
2	Knobble I.	1 25 50 S.	37 3 10	5,881
2	Knobble II.	1 32 42 S.	37 8 0	5,964
2	Lam 17	1 51 13 S.	35 57 13	7,600
2	Lam 11	2 10 5 S.	35 56 32	6,580
2	Machako's hill (south) ...	1 33 0 S.	37 16 36	6,590
2	Kiketi 1	1 47 45 S.	37 21 42	6,700
2	Kiketi 2	1 50 7 S.	37 25 35	6,650
2	Wai	0 41 10 N.	34 10 44	4,970
2	Samia highest	0 17 57 N.	34 9 19	5,280
2	Nakuru lake			5,845
1	Elmuteita lake			5,860
1	Coll to south-west of Loldiani...			8,500
1	Lowest dip in Mau heights to northward of Loldiani	NOTE.—For these lati-		8,850
2	Likipya 1...	tude and longitude were		7,520
2	Likipya 2	not taken. Distances for		8,240
2	Likipya 3	computing height were		8,880
1	Kepur 1	taken from plane-table		5,640
1	Kepur 2	sheets.		5,000
1	Plain at base of Kepur 2 ...			4,620
1	Kepur 3			5,250
1	Kepur 4			4,840
1	Plain at base of Kepur 4 ...			4,400

Before the reading of the paper, the CHAIRMAN (Sir Charles W. Wilson, Vice-President) said: I am sorry to say that the President is unable to be here this evening to take the chair for the interesting paper which is about to be read. The paper this evening deals to a great extent with what is known as the Sclater road, named after the late Captain Sclater, who was at the head of the expedition sent out to make the road. If his life had been spared, he would have taken very high rank, if he had not been in the very front rank, amongst the pioneers of African exploration. The paper has been written by Captain Smith of the Royal Engineers, who was second in command to Captain Sclater.

After the reading of the paper, the following discussion took place:—

Major-General Sir FRANCIS DE WINTON: We are all much indebted to Captain Smith for his most excellent and interesting lecture, and I am sure I don't think there is any part of Central Africa more completely surveyed than that between Kibwezi and Mumia's. It is very difficult, unless you have been in a country of that kind, to understand the amount of work involved in such a survey and such a road as that on which Captain Smith has been employed. One has also no idea what a really useful thing it is to have a good map showing the route you have to take and the distance you have to traverse. It is one of the heart-breaking things in travelling in Africa that you never know when you are going to get to the end of your journey. The native has no idea of distance; he measures by time, and the native ideas of time are equal to his ideas of distance, *i.e.* absolutely *nil*. You go on very often marching and marching, as I have done myself, never knowing when you may get to the end of your journey; therefore maps such as these are of very great help indeed. I am very pleased to see that they have altered the line of the railway. Instead of taking it up to the north-east corner of the Victoria Nyanza, they are going to bring it out at Ugowe bay. When I was in Mombasa, I sent a party that way under Major Eric Smith to see whether that route was not practicable for a railway to Ugowe bay. It seemed the shortest, and of course in all railway-making, generally speaking, the shorter you can make a line, the cheaper it is to build, and you have less wear and tear for your rolling stock. The great advantage of a railway in tropical Africa, indeed, the whole question of a railway, may be summed up in one word—transport. If you have transport, you can bring the products of the country to the European markets at a profit; if you have no transport, you can only touch the fringe of the coast-line. You can bring certain goods down, but otherwise you have no chance of opening up the country, and the best transport of all is a railway. When I came back from the Congo, I told the King of the Belgians that until a railway was built from the head of the navigation of the lower river at Matadi to the beginning of the navigation of the upper river, although he had one of the finest properties in Central Africa, it would be of no use. Since then they have built a railway, and the revenue of that country, known as the Congo Free State, is now equal to its expenditure. This shows what can be done by energy and carefulness in opening up these tropical parts of Africa. I don't know that I have anything more to say, except to thank Captain Smith for his most interesting lecture.

Mr. O'CALLAGHAN: I cannot tell you much about the railway which has not already been published. It is now laid up to Kikuyu, a distance of 335 miles, and there is a distance of 30 miles of tolerably easy-going country to the Kikuyu escarpment, and it will for the present be carried down into the rift by temporary expedients. Up to Lake Naivasha, we follow very much Colonel Macdonald's line. From Lake Nakuro is the deviation Captain Smith speaks about, although it seems to be slightly south of the country he surveyed. So far as we know, it saves about 100 miles, but it is early yet to speak of what the engineers will be able to do. The railway is now used for transport up to Kikuyu.

Mr. RAVENSTEIN: I have had a great deal to do with African travellers and their work, and to me a man like Captain Smith is most welcome. We have had no end of men going across Africa and bringing home reports, but these were only preliminary reports. They were like flies that live for two or three days and then die and are thrown aside. We have now placed before us some work that will last. In Europe, the age of measurements, as Peschel calls it, arrived more than two hundred years ago. In tropical Africa it is only now coming. It is something like geological formations; they are not all chronologically equal. One formation in Europe may be much older than a very similar formation in Africa. Thus, while the age of measurement in Europe, and especially in England, lies much behind us, in Africa it is only just coming. You will be surprised to hear that there are thousands of men who have travelled in Africa, and compelled unfortunate people like myself, not only to read their books, but also to try to get something of use out of them. Now, the very fact that Captain Smith has made a trigonometrical survey and determined certain positions enables us to take loads of Blue-books and other books and throw them into the waste-paper basket. Rent in this country is a very serious matter, and though you may be compelled to pay rent for yourselves and your domestic animals, you are very loth to pay rent for a lot of obsolete literature. Fortunately for that class of literature, there are the Royal Geographical Society and the British Museum. They are stores which like to embody everything, and if you have literature of that sort, send it to the Royal Geographical Society.

Apart from this trigonometrical survey, which, as far as altitudes are concerned, is not of a final nature, although Captain Smith has much confidence in his results, we have very little else of the same quality. We have had d'Abbadie's in Abyssinia, we have the Royal Engineers' work in the same country, and the Italians'. Another trigonometrical survey from the Nyanza to the Tanganyika is comparatively recent; but apart from these, I do not know of any other surveys of the same class in tropical Africa. I really do hope that in future those who can influence work in Africa will insist on the work being done thoroughly. Any person can now go across Africa from coast to coast, but that is of little interest to us. If there are tourist clubs that like to give men of that class gold medals, let the tourist clubs do it; what we want are careful surveys, work giving us something like finality. Much, in this direction, requires to be done, and we have seen from Captain Smith what one man can do, and that, too, at a paltry cost of only £100. We want spirit-levellings, about which our chairman knows a great deal, having done some most interesting work of the kind himself—spirit-levellings to some of the big lakes. We have meteorological stations on these lakes, but barometrical observations are comparatively of little use until we are able to reduce them to sea-level, and this can only be done after we know the exact height of the stations. At present we can only judge the heights by estimates. Thus we travel in a vicious circle, like a circus horse that is always moving, but never gets to the goal. Now, we want spirit-levellings along the line of Captain Smith's survey. I don't say his determinations are very erroneous, but he will admit that we want something more perfect. We want another line to Lake Nyanza, and a line from Nyanza to Tanganyika. I feel quite sure this could be done at a very moderate cost, and it would prove of the utmost scientific value, giving us proper data for calculating altitudes throughout tropical Africa, based on aneroid or barometrical observations.

The CHAIRMAN: I hope you will allow me to convey a very hearty vote of thanks to Captain Smith for the extremely interesting lecture he has given us this evening. His work may be divided into two parts: the first was the construction of

the great road from the coast to the Victoria lake; and I think you will agree with me that he and the late Captain Sclater showed, during the progress of that work, a fertility of resource and a power of gaining the confidence of the natives which are beyond all praise. I always watched the career of the late Captain Sclater with the greatest interest, and I fully concur in the tribute which Captain Smith has paid to his memory this evening. The second part of the paper deals with the work done by himself, viz. the survey from the coast to the Victoria lake, and I can only say that it has been executed with great care and exactitude, and that it is a very solid contribution to our knowledge of Africa. I have looked through the appendices to his paper with very great interest, and, as an old survey-officer, I can bear testimony to the great care with which the survey has been made, to the accuracy of the observations, and to the admirable way in which the work was carried out. I hope he may be spared to make further surveys, if his inclination leads him again to Africa. It is just such surveys that are so much wanted there. I hope you will allow me to convey to him your very cordial vote of thanks.

THROUGH THE HUN KIANG GORGES; OR, NOTES OF A TOUR IN "NO MAN'S LAND," MANCHURIA.*

By ROBERT T. TURLEY.

As the attention of many is turned to North-Eastern Asia just now, perhaps a few notes on a district little known at present, but which must become of more importance in future, may be of interest.

Captain Younghusband's party traversed, some years since, the northern portion of the region in question, and a good description of that section may be found in Mr. James's able book, 'The Long White Mountain.' A reader of this book would naturally conclude that the country is almost impassable. The contrast, however, between summer and winter travel is as great as the difference in temperature, which is tropical or arctic according to season. In winter locomotion is usually rapid and easy, and the route taken by Captain Younghusband from Mukden to the Yalu can at that season be traversed by heavily laden freight-carts in eight days, though the distance is fully 250 miles. The valleys on the 42nd parallel east of Mukden run almost east and west, and where rivers and bogs are frozen, travelling on this route is easy. Once on the Yalu, a good road exists on the ice to a point not far distant from Possiet bay, which could, no doubt, be duly reached by carts. A Russian scientific party dragged a four-wheeled vehicle, before winter set in, across from Vladivostock to the fine cart-road above referred to. Teams, dragging carts with two tons of goods, were daily seen, denoting good roads, and by their large numbers a prosperous country.

"No Man's Land," or the once neutral zone, commences about 80 miles east of Mukden, from which point due east to the Yalu is about 150 miles. Further north the "neutral zone" was much wider, whilst

* Map, p. 352.

near the mouth of the Yalu it was only about 20 miles wide. This area, once a wilderness, but thrown open to settlers about 1860, was slowly occupied and brought under cultivation. Until quite recent years this cultivation did not extend far north of lat. 43°, but now the whole area is being rapidly peopled, and fully 50,000 square miles are settled and organized.

Although all maps show a palisade of stakes along the boundary, there seems but little doubt that no such ever existed. There was a rough dyke of earth across the valleys, especially where gates guarding the routes into Korea were situated, but nothing more. At the present day, certainly, no native knows of a palisade anywhere.

This land is generally very fertile, and is almost everywhere known to be rich in minerals—gold, copper, iron, coal, and silver, which have hardly as yet been touched. There are not very many high or rugged mountains, but the whole region is hilly, and in some sections wild and grand. Wide and fertile valleys abound, and if due care were taken to retain the rich forest soil on the hills, many of these could be perpetually cultivated, and good maize, etc., grown. No care is, however, taken, and the soil is soon washed off the steeper slopes, whilst, despite the warnings of Eleucius two thousand years since, the settlers—Shantung emigrants—are striving to emulate their ancestors of Eleucius's time, and do all in their power to strip the hills of all timber, and even scrub, causing droughts and floods in regions where such would otherwise scarcely be known.

The southern part of "No Man's Land" was once occupied by Koreans, who were driven out and over the Yalu by Chinese, who settled in their places. These were in turn driven out and deported westwards by the Manchus early in the seventeenth century A.D., so that a buffer, or uninhabited zone, might be formed between Chinese or Manchurian territory and Korea. It is scarcely forty years since it entailed a death penalty to settle there, but at about that time the outlaws became unmanageable, and settlers were allowed to enter. The robbers in time became peaceful and law-abiding farmers; they formed guilds, which to this day, although their former power is now largely in the hands of the regular mandarins, maintain better order than anywhere else in Manchuria. Property is still quite safe, and brigandage—the curse of Manchuria—is in these semi-wild regions, where guilds exist, practically unknown, whilst an independent and enterprising race has grown up.

Leaving Mukden early in February, we travelled almost due east for about 80 miles, going up the Hunun river as far as a place called Ying Fan, where it is joined by a large stream called the Shu tsu Huo, coming in from the east, whilst the main stream is now from the north-east. Our route followed the east river, more or less, for, being lightly equipped, we could cut corners over the spurs of hills. Heavily laden

carts follow the river. The country is very pretty, but not very wild or rugged, consisting of hills and open valleys, with a good number of inhabitants. Seventy miles from Mukden we passed Yung-ling, now a small and unimportant market town. It is, however, famous as the place where the Manchu power had its first origin, and for the tombs of five old chiefs near by.

Just beyond Yung-ling is Shing King, a small walled village, with a few dirty Manchu soldiers. It once boasted the dignity of a capital city. Five miles beyond this is the place where "No Man's Land" was entered by the so-called Korean Gate, though there is now no sign of gate or barrier. From this point to the Yalu is about 75 miles.

Twelve miles beyond Yung-ling the Shu tsu Huo river is joined by a large stream from the north-east. At the junction is the town of Shin Ping Fu, the seat of a large and flourishing trade, and the head-quarters of the district magistrate, who performs many of the duties of a prefect. This town is the emporium of a large area, trade flowing in from all sides. Timber is brought on carts and sledges, and stored until the flood season, when it is despatched on rafts to Mukden. The Mukden river is not navigable above that city. Timber is sent from Shin Ping Fu south over the hills to a place called Chien Chang, 40 miles away, where there is a large affluent of the Tai tsu Huo, which flows past Liao-yang and down to Niu-chuang. By it timber is thus sent to Niu-chuang port.

The merchants of Shin Ping Fu are enterprising. They are obtaining much of the Eastern trade, the principal articles being on the one hand gold-dust, ginseng, deerhorn, furs, medicines, and grain, and on the other foreign stuffs, especially cotton goods, lamps, and kerosine oil, for which there is evidence of a large demand. Once in "No Man's Land," there are no vexatious Manchu copyhold land laws, and no *Imperial tombs*, to restrict mining within a wide radius.

Ten miles beyond Shin Ping Fu we crossed the watershed and went down into a valley, the stream of which runs into the Fu Kiang, a tributary of the Hun Kiang, a large river flowing into the Yalu. The watershed is crossed at about 2000 feet above sea-level, but the ascent is so gradual—the ridge itself being only a few hundred feet above the valleys—that one does not realize it. In the distance, to the south east, were some fine expanses of dense pine forests, but the best trees have already been cut down. The hills were part of a long chain called the Kang Shan Ling, the geological formation of which differs much from that of the older hills which we had been travelling through. On crossing the ridge, we found, instead of coarse granitic rocks, fine gneiss, limestone, and clay slate, with iron ore, copper, and also silver. In fact, there are many indications that this range is rich in minerals. Gold is quite abundant in some of its eastern valleys, and in one last season three thousand miners were at work; much gold was obtained,

including some quite large nuggets. Dealers purchased the gold on the spot for twenty-nine ounces of silver per ounce of gold, and sold the same in Mukden for thirty-three to thirty-five ounces of silver. Every miner has to obtain a licence; the government price is about three-hundredths of an ounce of gold per month. The local official in charge, however, doubled this amount. The gold is best and most plentiful at the head of a narrow valley called Erh Tao Ku. In another valley ten thousand men were at work some years since, and found gold plentiful; but trouble arose, and since then no work has been allowed there. The people have no idea of seeking gold except in the sand and shingle, and do not believe that it exists in solid rock.

The centre of the gold district is the town of Tung Hua Hsien, 180 miles east-south-east of Mukden. We struck the Hun Kiang to the south-west of the town, and followed its course in preference to a climb over a ridge. Travelling on the ice, we wound up through a deep gorge, with a hill of gneiss on one side, and on the other limestone which had been cut away, leaving perpendicular cliffs. We emerged into a wide open valley, coming down from the east-north-east, skirted on either side by limestone hills, and opening out in many places into beautiful and fertile side valleys. The limestone is blue, but it has undergone some severe experiences, being foliated, and often changed into impure marble. The fissures have been frequently filled in with quartz, and often the strata stand up almost perpendicularly. The directions of foliation are always in a line with the valley, but irregularly. There can be but little doubt that there was once a large lake here, whose bed was raised by volcanic action; this is borne out by some bluffs of conglomerate, consisting of rounded and smooth boulders of rocks, foreign to the limestone surroundings, set in a hard matrix of red lava-mud.

Farther up the valley is a ridge coming in at right angles, consisting of ironstone, with lime, and probably much coal, for in one nook are several mines. The coal is bituminous, full of petroleum, and burns with a clear flame and hardly any smoke. It makes splendid coke, and quantities are sent down the Hun Kiang on the timber-rafts to the seaport near the mouth of the Yalu.

Coke is burnt in pits, very much as charcoal is made. The iron ore is very good, and looks like lead ore when freshly broken. The natives extract forty pounds of iron on an average from one hundred pounds of ore. It is broken into lumps about the size of small walnuts, and placed with coal-dust in dried mud cylinders. These are about 4 inches in diameter and 30 inches in depth. A bed is formed by layers of tiles, so placed that an inch space is left between each tile, the spaces being filled in with coal-dust. A mud wall surrounds this bed of tiles on three sides, the other side being open. The walls rise only a few inches above the cylinders, a hundred of which, or thereabouts, are placed in a bed. Between the cylinders is placed coal-dust, and the whole is ignited

gradually, by fire penetrating from the open side underneath the tiles. In a few hours all the mass is in a red glow and burns brightly, but much heat is wasted by the open nature of the furnace. The furnace burns out and cools down, when the congealed iron is separated from the dust and slag, and remelted in a second furnace. This latter is a crude blast furnace, made of dried mud in the form of a cauldron or bowl, 4 feet deep and 2 feet in diameter. Wood fuel is used, and a draught made by two bellows—boxes with a movable side, which is driven in and out by two men, who thus force air into the furnace. The molten metal is drained out into moulds, and cast into various articles, chiefly temple bells and plough-shares.

The iron makes very good steel; but this and wrought iron generally are made from old European iron, old horseshoes and gas-piping being in evidence in the blacksmiths' forges near by. The question arises, how can old iron be brought from Europe and delivered here, over 200 miles from the nearest river-port, more cheaply than native wrought iron, despite cheap labour, can be made?

The coal now being worked is not in beds, but has the appearance of having been pitched with great force into a gorge. The miners have gone down over 100 feet, and are still in the coal, which rises nearly to the surface, and in the coal are many roughly broken rocks of coarse gneiss. Farther north-east, towards Mao-erh Shan, we were assured that coal, splendid coal, abounds; whilst due north 100 miles away there is a mine, which is very productive even when worked by native methods. Copper is being worked, but not to any extent, still further within the hills; whilst over the Yalu, in Korea, it has been worked for ages.

There are about ten thousand families of Korean settlers to the north and east of Tung Hua Hsien. These are now under no law; the Chinese Government ignores their existence, and the Korean, since the Japanese war, has no control on this side. Previously the Chinese controlled the Koreans within its borders by a mutual arrangement, not very satisfactory to those governed. The Koreans are here a quiet, law-abiding people, but they feel their position, and yet do not like to leave their little homes, especially as they have prospered fairly well. They own their lands indirectly through Chinese, who pay the land-taxes. A stranger would not realize that there could be so many Koreans. They are a very shy and retiring people, and inhabit the nooks and higher valleys, whilst the Chinese occupy the main valleys.

In a valley called Lo Cheng Ku, we heard of a wonderful foreigner who shot small birds on the wing, having been there with others twelve years since, and no doubt it was either Captain Younghusband or Mr. Fulford. A Russian scientific expedition had been through here last autumn (1897), and its four-wheeled carriage, probably a tarantass, had caused some amusement. From Lo Cheng Ku we retraced our steps

to Tung Hua. As already mentioned, a good road for heavy traffic exists in *winter* right through from Mukden to the Yalu, passing south of the Lao Ling, which gives summer travellers trouble. Once on the Yalu, a good sledge road runs right up to near the Long White mountain, and thence across, it is said, to Possiet bay.

From Tung Hua we went south-south-west down the Hun Kiang, leaving behind us the forests and piles of timber awaiting the spring. We saw a Korean with a large dead tiger on a sledge, and some Chinese with four tigers—two of them enormous brutes—on a cart. All had been shot in the forests about Mao-erh Shan by guns set in the jungle in paths frequented by the tiger. They are generally placed near some animal that has been killed, or a bait; a string attached to the trigger causes the gun to go off, and usually, if the animal is not killed, it is so badly wounded as to fall an easy victim to the hunters. The shot usually enters the shoulder or the heart. It is very difficult to find the spot where the wound has been, it having been most carefully washed and sewn up, so as to not lessen the value of the skin.

After about 80 miles we came to the town of Huai-yen Hsien, a small place situated in a plain. The river winds with a big westerly sweep round a famous mountain north of the town. This mountain is famous, according to tradition, because five great chieftainesses, six hundred years since, had a stronghold on the top, and it is consequently called Wu-nu Shan (Five Women mountain). It rises rather steeply about 1000 feet above the plain, then in an abrupt and perpendicular cliff of basalt another 400 or 500 feet. The top is an irregular square measuring about three acres, and is quite flat, with Taoist temples, and a large pool of water in the middle. The approach is by one solitary path, and thus the hill forms a perfect retreat.

Leaving Huai-yen, we soon plunged into the beautiful and almost unknown Hun Kiang gorges. Here the river has cut a deep bed through hills for nearly 50 miles, winding in all directions. In many places, as we travelled on the ice, it was dark and weird, and not a sound broke the stillness. The water was flowing in a strong current beneath the ice, and here and there were open pools, caused generally by warm springs. These are rarely, if ever, frozen, even though the ice around is 4 feet thick. At these pools of open water we almost always saw a small black bird, which we had never before noticed—very like the common English blackbird in appearance and movements, but a little smaller. These lively birds winter in and near these pools, sitting on a ledge of ice, usually under another ledge. They dart in and catch the small fish, wading also, though their legs are short, where the water is shallow, but appear unable to swim. The common wild duck and mandarin ducks in larger numbers seem able to winter in a climate where for nights together the thermometer is below zero, given there are open pools of water which do not freeze.

The cliffs rarely rise in the gorges more than 600 feet above the river-bed, and usually about 300 feet. In many places the bed is only 150 yards wide, and in one or two much less. The rocks are black basalt, especially on the eastern side, for a long distance. Then gneiss appears, followed by an odd limestone section, and at the lower end basalt is again seen, with huge whitish-yellow rocks of quartz and also gneiss. The basaltic cliffs are often very beautiful. Owing to their columnar structure, castles, church spires, and Gothic pinnacles seem to rise sharply one above another, while miniature glaciers fill up pretty cavern-like niches. Gothic arches are filled in with ice tinted by oxide of iron, and hence look like rough stained-glass windows, whilst the white snow-covered ice below, glistening here and there in the sunlight, shows up the dark shadows in perfect relief. The castle towers and pinnacles are crowned with dwarf fir trees, and here and there a wee log-cabin is tucked away under a sheltering rock. All was quiet and in winter sleep, but every now and again carts with women and children were met going to the homes their husbands and fathers had prepared for them, taking with them all their riches, consisting of a few cattle and a little furniture. These people, originally, if not directly, from Shan-tung, make splendid settlers, being hardy and industrious. They, however, retain their ancient propensity for stripping bare the hills. They follow the wood-cutter and clear the ground by fire; they cultivate the steepest slopes and never terrace, hence the soil soon washes away, and a fresh space has then to be cleared. In time, when the land cannot support them, they begin to terrace, but most of the hills are then useless, and fuel scarce. Forest laws are much needed, and whatever power may rule, a first step must be to save the remaining forests, and to compel the people to cease the wanton waste now going on, which causes the droughts and floods which make life so uncertain in many places.

Large families are a great *desideratum* with these settlers, the boys being required for work, the girls to sell for wives. Women for wives realize four times the usual value in "No Man's Land." Again and again we met carts with salt and cotton goods, etc. These had been down to Sha Huo-tsu, or An-tung Hsien, with grain and local produce, and were returning north to various places. From Tung Hua Hsien to An-tung, the great river-port of the Yalu, 40 miles from the sea, is a distance of only seven or eight days for heavily laden carts, which, travelling on the ice to below the Hun Kiang gorges, strikes across to the Yalu by a good road. There is only one pass, and even here, thanks to the local guild, the road is well cut. The Hun Kiang turning back east-north-east, they go down on the Yalu ice-road, or more frequently stop short at one of the smaller ports.

The Yalu trade is becoming very important, and is destined in the near future to be very great indeed. Vast quantities of timber, grain,

etc., are annually shipped per sea-junks, whilst river-junks run up 600 miles, calling at the twenty odd little emporiums on the river-bank, Chinese side. There are many places, too, on the Korean bank, as well as many towns just inland. The up-stream route is somewhat slow, owing to the usually strong current.

Before leaving the Hun Kiang gorges, one must mention that near the lower part of them is a large basin with huge rocks, where there must be in flood-time an awful whirlpool; the lower end is guarded by a large quartz bluff. These whirlpool rapids smash the rafts, so that the owners build them in sections, with the logs firmly tied across each other, whilst the sections are loosely joined; even then many smash up, judging by the remains we saw. Otherwise, one would think that this river might be used for upward navigation.

Below the gorges we found that the wild silk, or oak-tree silk, was being widely cultivated. It is only of late years that it has extended so far north. There are no Korean settlers down here, but before leaving them it should be added that they have now for three years succeeded in growing paddy rice on boggy ground in "No Man's Land," under the 41st and 42nd parallels. The Chinese are naturally conservative, though in "No Man's Land" less so than usual; yet they were slow to encourage the Koreans to cultivate water-land rice. Now, however, they purchase readily all the Koreans can produce, and doubtless will themselves extend the area, as much of the bog-land in Manchuria would, were the Korean methods adopted, grow it well.

The country produces such a superabundance of food-stuffs that the present population is content not to try experiments. The rivers and streams have not a plentiful supply of good fish, although the water must be the same as that which runs into the Sungari, where the finest kinds of freshwater fish abound. Salmon, for instance, breed in vast numbers just over the hills, in rivers which connect with the cool, clear waters of the Japan sea, but none venture into those whose outlets are in the Yellow sea. That good freshwater fish might be cultivated is proved by the fact that one tributary of the Hun contains splendid trout, which are preserved for the court in Peking, whither they are sent frozen. A nice one was given to us, which reminded us of a home dish.

The Yalu, both above and below the junction with the Hun Kiang, is a noble stream; the width between the hills on either side is comparatively regular, and averages about 800 yards. The river in winter, or rather the ice, is about 500 yards across. On the Chinese side the hills generally end abruptly in almost perpendicular cliffs, wooded with scrub-oak, and composed of gneiss, mica schists, etc. The valleys often have narrow outlets opening out further inland. A short distance from the river, limestone hills extend irregularly for many miles, whilst hills composed of igneous rocks have been thrust up through them. In one

valley we found splendid white marble; in another odd blocks of marble were being gathered for lime. Lime made from marble, the natives say, is useless for dying purposes, especially with indigo, and also inferior to that made from blue-grey stone for building purposes. Asbestos is dug from one spot, and used for lamp-wicks. Silver-mining does not pay; the veins, or "threads," as the natives call them, are bedded irregularly in hard quartz, and this with their methods, together with the cheapness of the metal, makes the working of the mines useless, to say nothing of the trouble that is certain to arise with an unenlightened government.

On the Korean side of the Yalu, the hills differ somewhat from those on the Chinese side, but are said to be rich in minerals. They are much less wooded, and present no signs of oak-silk culture, which is carried on everywhere on the Chinese side, south of the Hun Kiang mouth.

The trade of the Yalu is timber. All North-East China draws its supplies hence, and but for the wanton waste it would still last for years. Next to timber, beans, bean-oil and cake rank for quantity. From An-tung, the port for sea-junks, fifty thousand tons per annum is said to be a minimum of the beans alone exported. Maize is very largely grown. It needs but little labour, growing on the steep hill-sides until the soil is washed away.

The import trade bears no comparison to the needs of the people. Given better and more regular markets for their exports, the demand for European materials for clothing and for luxuries would be very great. This refers to the Chinese, whilst the border Koreans, who are the most manly, and in fact *the* traders of Korea, would be large consumers. One wonders why the Yalu has never been opened to foreign trade. Ocean steamers could find a good port at or just below An-tung (or Sha Huo-tsu), whilst smaller river steamers could run up to the Hun Kiang mouth, and tug-boats with barges could go up 600 miles. The said barges could sail down-river easily.

Leaving the Yalu, we struck north-west, and after travelling about 20 miles came on the remains of a pre-Manchu walled town, called Yang-tien. Another 10 miles brought us to Kuan-tien. The places hereabouts are all marked on the maps as cities, but all are equally empty, except Kuan-tien, which we reached at noon on the second day. It is about 55 miles from the Yalu, and is the seat of a district magistrate. According to an old stone tablet still there, this city was built about three hundred years since. The walls are nearly a mile each way, with a gateway in each wall, except the north, where there was no opening, as bad luck was feared from a certain hill in the distance. The walls were built of lava blocks, very well squared and fitted, but with no mortar, and were surmounted by brick ramparts, which have disappeared. Forty years since, old men told us, the whole city, together

with the country around, was a dense forest, famous for its deer and wild boar. Now all the land is cleared and well cultivated, whilst a small market town covers a portion of the space within the old walls.

Near the town is a beautiful hill—a comparatively modern crater—which rises gently from the plain to a height at the rim of about 600 feet. The base is about 1000 feet above sea-level. Around is a plain extending about 10 miles by 30, which was, without doubt, once a large lake surrounded by old volcanoes. Their craters had been filled up with basaltic rock, which now stands up black and rugged, whilst the old walls have been washed away. These certainly all belong to an earlier period than the crater in the plain. A river winds through the plain and around the crater's base, having cut a deep channel through at least ten well-defined beds of volcanic matter, right down to the old lake-bottom, which was upheaved, more or less, near the crater. The lake seems to have been gradually filled until its bottom rose level with its outlet. It was then drained dry, and its river cut a deep bed as above described, and rushes into a valley at a lower level to the south.

North-west and south-east of the crater for many miles, patches of land, in one place fully 2 miles square, were covered with huge volcanic bombs, the larger of basalt which had been partly remolten, the smaller of coarsely vesicular lava, while, from the iron oxide seen, others must contain much iron. This output must have been a sudden shower, as the bombs are strewn over the surface of a deposit formed subsequent to the draining of the lake.

North-west of the crater our road wound through a gorge, the side valleys of which are still filled to a great depth with burnt sand, and pebbles, black and dirty, bedded in clean sand in thick beds. In a recent cutting, worn by a stream which made a new bed for itself last year, there are trees which are now inferior lignite, and have been charred as they were swept along in the heated sand. Further north-west is another plain, rising from which is a noted mount, "The old White-headed Rocks." It rises steeply for about 2000 feet, and then two huge pinnacles, with a smaller one between, rise at a very sharp angle, almost perpendicularly, for nearly another thousand feet. The pinnacles and all the upper portion are bare white quartz rock, which looks like yellowish-white snow.

Further north-west we descend into a valley at a much lower level, and striking the Ai Kiang, a tributary of the Yalu, which empties into the latter nearly opposite the Korean town of Ai Chu, or Yi Chu, we followed it to the old frontier city of Ai Yang, now a mere village, and there emerged from the once "neutral zone." In the Ai Kiang, which is very shallow, we find beautiful boulders of conglomerate, such as the Japanese polish into balls, etc. They are

composed of pebbles, closely set in a minimum quantity of black lava as a matrix, and are usually of quartz of every colour. Here for the first time since entering the zone we met with pure granite. One bluff, however, we had seen a few miles back. The exposed surface looked like red Aberdeen granite, finely grained and pure.

A few miles beyond Ai Yang is Huang Ku, a famous though small coal-mine. It is in the old Chinese territory, and has been worked a long time. The seam is only, at the best, 2 feet thick; but it runs horizontally into the hill some little distance above the base, and is tunnelled for over half a mile. This coal is expensive, and is noted as the best for blacksmiths' use in the province. The bed has not been disturbed by volcanic action, and is easily drained. From here on to Mukden the country abounds in coal and splendid iron and limestone. The best coal can rarely be obtained, because of the water and the absence of pumping-machinery. Iron is now but little smelted; but, with European enterprise and its waterways, which can be made navigable, this will become the "Black country of Manchuria," and No Man's Land an "Eldorado." *

THE CAMBRIDGE ANTHROPOLOGICAL EXPEDITION TO TORRES STRAITS AND SARAWAK.

In 1888, Dr. A. C. Haddon, F.R.S., went to Torres Straits solely with the intention of studying the coral reefs and marine zoology of that district. When engaged in his zoological studies, Dr. Haddon's interest was attracted towards the natives, and he devoted his spare time to recording all he could learn about their past manners and customs, in addition to what he observed of their present mode of life. He was led to devote a good deal of time to the subject, as he found that none of the white residents in Torres Straits knew much about the natives, or cared about them personally, and as the natives were in some cases rapidly either dying out or becoming modified by contact with alien races. Some of the results of these investigations were published in the *Journal of the Anthropological Institute*, xix. (1890) p. 297; *Folk-lore*, i. (1890) pp. 47, 172; *Internationales Archiv für Ethnographie*, iv. (1891) p. 177; vi. (1893) p. 131; *Proceedings Royal Irish Academy*, (2) ii. (1893) p. 463, iv. (1897) p. 119; *Cunningham Memoir*, x.; *Royal Irish Academy*, 1894. All of the zoological results have not yet been published, and the geographical and geological observations were published in a joint paper, 'On the Geology of Torres Straits,' by Professors A. C. Haddon, W. J. Sollas,

* South-east of Mukden the natives have splendidly made turbine water-wheels; but they use the power, not for crushing quartz, but for grinding the bark of the elm tree into powder for incense.—R. T. T.

and G. A. J. Cole, in the *Transactions of the Royal Irish Academy*, xxx. (1894) p. 419.

The region in question is one of some interest, as it lies at the end of what Suess has termed the Australian Cordillera, with its attendant great barrier reef. This ancient continental range has been weathered down in the north to simple hills, which emerge as scattered islands across the narrowest portion of Torres Straits, and perhaps finds its northernmost extension in the isolated hill of Mabudauan, near the coast of New Guinea. The latter hill was probably at one time an island, which has been engulfed by the encroaching delta of the Fly river, and thus has become annexed to New Guinea.

There is a triple division of islands in the archipelago of Torres Straits; the lines of longitude 132° 48′ E. and 143° 29′ E. conveniently demarcate these subdivisions. The central zone is composed solely of low coral islets; in addition to such islets in the western zone, there are numerous islands of varied size, composed of old igneous rocks. To these islands reference has been made; while it is only in the eastern zone that volcanic islands, such as Erub and Mer, and the islands adjacent to them, are to be found. Great stretches as well as isolated patches of coral reef are also plentifully distributed from the western entrance of the straits to the oceanic edge of the great barrier reef.

The Murray islands, Uga and Erub, by the recent nature of their volcanic rocks, all of a basic type, belong to a line of later movements than those implicated in the Australian Cordillera, and may be regarded as pertaining to that great system of still progressing folds which are included in the Pacific "zone of fire." It does not appear to be possible to fix the date of this volcanic outburst. All that we can say is, that there are no traditions respecting it, and a good deal of subsequent weathering has taken place. It is manifestly erroneous, as is sometimes done, to mark these on maps as recent volcanoes, as this implies that they have been active within the human period, and of this we have no proof.

In some maps the Torres Straits are marked as a region of elevation; but, as has been pointed out in the paper on the geology of Torres Straits, no recent movement of elevation has taken place. Dr. Haddon's recent visit corroborates this general statement: there may have been recent slight oscillations of level, but no pronounced upheaval has occurred. Subsidence is more difficult to prove, but there is no evidence in favour of this alternative. Tennison-Woods has several times stated that the North Queensland axis is a stationary area.

The Syndics of the Pitt Press at Cambridge having agreed to publish a monograph on the Torres Straits islanders, Dr. Haddon determined to return to that locality in order to supplement and verify his earlier ethnological observations, and to do this more completely, he took out with him half a dozen colleagues. The work of the second expedition was

apportioned as follows: Dr. Haddon was responsible for the physical measurements and observations; he also recorded the manners and customs, legends, and other ethnographical data, as well as continuing his previous studies on the decorative art of British New Guinea; Dr. W. H. R. Rivers organized the researches on experimental psychology, he himself taking all the observations on vision; Dr. C. S. Myers experimented on smell, hearing, and reaction time; Dr. W. McDougall, in addition to other studies, made observations in tactile sensibility; Dr. Rivers carefully collected numerous sociological statistics, and Dr. Myers also interested himself in certain customs; Mr. S. H. Ray devoted himself to linguistics; and Dr. C. G. Seligmann chiefly studied local pathology, native medicine, and collected some of the animals and plants that are utilized by the natives.

The expedition left London on March 10, 1898, and arrived at Thursday island on April 22. On April 30 a start was made for the Murray islands, which were reached on May 6, after an unduly prolonged and uncomfortable passage.

This group was selected for detailed study on account of the difficulty of getting there. It lies out of the track of what little commerce there is; neither is it frequented by pearl-sellers or bêche-de-mer fishermen, consequently the natives have not mixed so much with Europeans and other alien races as has been the case with Erub (Darnley island) and the western group of islands. On the other hand, the islands have been subject for a quarter of a century to more or less missionary influence and teaching, with the result that most of the natives are professed Christians, and for nearly ten years English has been taught to the children. The foreign cult and civilization have undoubtedly had some effect, but experience proved that they were not detrimental for many of the purposes of the expedition. Perhaps on the whole it would not be easy to find a more favourable spot for the study of a simple and primitive people.

The various investigations were soon commenced, and all the party had made a good start when, through the kindness of the Rev. James Chalmers, of the London Missionary Society, an opportunity presented itself for a visit to the mainland of New Guinea. For several reasons it was important that certain observations should be made on natives of the south-eastern peninsula of New Guinea, as well as on some of those inhabiting the estuary of the Fly river, for the sake of comparison with the islanders. Dr. Haddon therefore took Messrs. Ray and Wilkin and Dr. Seligmann, and this party first proceeded to Delena, on Hall sound, on their way to Port Moresby, which was reached on May 31. During the absence of Sir William Macgregor, Mr. A. Musgrove, the resident magistrate, did all he could to forward the objects of the expedition, and he placed at Dr. Haddon's disposal for a fortnight the Government fore-and-aft ketch, the *Peuleule*. A fresh start was made

early on June 2, and the marine village of Kaile, or Gaile, was reached that evening. It appears that the real name of this village is Seriseri. Kapakapa, or Siruwai, as it should be called, was visited on the following day, and Dr. Haddon and Mr. Ray paid a visit to the Rev. W. G. Lawes, who has established a flourishing school for native teachers at Vatorata (Vatororuata), a healthy and beautiful spot about 1¼ mile from the sea.

On the following day Bulaa, commonly called Hula, was reached, and a stay was here made of twelve days. The natives were studied, and visits paid to the neighbouring villages of Babaka, Kamali, and Kalo, and to Keapara (usually known as Kerepunu) on the opposite side of Hood bay. On the return journey to Port Moresby, another visit was paid to Mr. Lawes and one to Mr. English, the Government agent of the Rigo district.

A stay was made at Port Moresby from June 17 to July 6. A short trip about 25 miles inland was made with Mr. Ballantyne, the Government treasurer and harbour-master, to visit the Taburi tribe; Mount Warirata was crossed at a height of 2615 feet. A number of natives from the mountains of the interior accompanied the party back to Port Moresby, and these were utilized for anthropometric purposes. On June 25 Dr. Seligmann went to visit Mr. English at Rigo, and he did not rejoin the rest of the expedition till September 14. He made one or two short trips into the interior in the Rigo and Mekeo districts, on which occasions some anthropometric and ethnographical observations were taken.

On July 7 Dr. Haddon and Messrs. Ray and Wilkin visited the Sacred Heart Mission at Yule island (Rabao). A flying visit was paid to Veifaa, a populous village about 18 miles inland, and situated near the Angabonga (St. Joseph river), the villages of Pinupaka, Mou, Babiko, Inawa, and Inawi were visited *en route*.

The Murray islands were reached on July 20. During the time Dr. Haddon and his party had been away, the psychologists had worked well, and had obtained a number of valuable and interesting results. The work of the expedition was continued in Mer, the largest of the three Murray islands, and the only one that is now permanently inhabited. Drs. Myers and MacDougall left on August 24, on their way to Borneo, and the rest left on September 8 to visit Kiwai island, at the mouth of the Fly river. A short stay was made at Saguane, where the party was hospitably entertained by the Rev. James Chalmers; a short visit was also paid to Iasa, the chief village of Kiwai island.

The expedition arrived at Mabuiag, a populous and thriving island which lies about halfway between Cape York and New Guinea. Here a stay of five weeks was made, and a considerable amount of work was accomplished. After visiting several of the other islands, Drs. Haddon

and Seligmann and Mr. Ray left Torres Straits on November 15, Dr. Rivers and Mr. Wilkin having left a short time previously.

Dr. Haddon's party arrived at Kuching, in Sarawak, on December 12, and here they had to remain till January 5; but the time was not wasted, as Dr. Haddon photographed a large number of Dayak fabrics and studied the decorative art of the natives of Sarawak in the excellent museum in Kuching; Mr. Ray also studied Malay.

Owing to the prevalence of the north-east monsoon, it was impossible to cross the Baram bar, and so the party had to proceed to Limbang, where a short stay was made, which included a visit to Brunei. The party were the guests of the hospitable Hon. O. F. Ricketts, the Resident of the Limbang district. The only practicable way to arrive at their destination was to proceed up the Limbang and its affluent the Madalam, and up the Trikan; then the foot of a spur of Mount Mulu, or Molu, was crossed, and the Baram river was reached *viâ* the Malinau and Tutau. Altogether the journey from Limbang to Marudi, or Claudetown, took eleven days.

The expedition was most hospitably entertained by Mr. Charles Hose, the Resident of the Baram district. Mr. Hose has explored the whole of his large district, which comprises some 8000 square miles of territory. The map which was published in the Society's *Journal* in March, 1893, will shortly be replaced by one of much greater detail and increased accuracy. Mr. Hose is well known as an enthusiastic naturalist, who has not only made great collections, but who has studied the habits of animals and has all the materials for a monograph of the land-vertebrates of Sarawak; it is not, however, so well known that this indefatigable enthusiast has a very intimate knowledge of the natives of Borneo, more particularly, of course, of his own district, and that he has recorded his observations in voluminous manuscripts; further, he has presented to the University of Cambridge a collection of ethnographic specimens from his district, the like of which is not to be found in any museum in Europe. Mr. Hose sent a pressing invitation to Dr. Haddon, before he started on his expedition, to visit him, with promises of helping on the objects of the expedition. All that was possible in the time available was done by Mr. Hose; and the members of the expedition who experienced his generosity feel they can scarcely adequately express their gratitude to him. Mr. Hose organized two up-river trips—one up the Tinjar and its tributaries, the Lobong and Dapoi, included an ascent of Mount Dulit; the second trip had for its main object a visit to Tama Bulan, the great Kenyah Penghulu who resides on the Pata river. The work of the expedition was brought to a close by the end of April.

FROM NJEMPS TO MARICH, SAVE, AND MUMIA'S (BRITISH EAST AFRICA).*

By Major H. H. AUSTIN, R.E.

As Colonel Macdonald has already mentioned, the expedition under his command was concentrated at Ngare Nyuki in September, 1897, and on the 21st of that month I started with the intention of proceeding to Lake Rudolf. Owing to the desertion and mutiny of our Sudanese escort, however, this destination had to be temporarily abandoned, and orders reached me subsequently to form a food depôt in Karamojo or Save instead. In five marches the column reached Little Njemps, situated to the south of Lake Baringo, on the river Nyuki—a spot familiar to me, Captain Pringle and I having visited that place formerly in 1892. The country traversed between Ngare Nyuki and this place was hilly and difficult for pack-animals, as in places a series of regular rocky escarpments had to be negotiated. Njemps, formerly a centre for Swahili caravans proceeding to Kavirondo and the great lake, has now sunk into comparative oblivion. Food is exceedingly scarce, and chiefly brought by the natives from Kamasia. In one short march of 4½ miles we reached Great Njemps, a large village surrounded by a thick boma, or fence. This place is one of the largest villages we saw during our wanderings, as it is nearly a mile in circumference. The natives are exceedingly friendly, and in appearance not unlike the Masai, though they do not possess the same warlike instincts. The large river Tigrish flows in a north-easterly direction close to Njemps, and enters the southern end of Lake Baringo. The column now struck north along the western shores of that beautiful sheet of water, in the centre of which are five picturesque islands densely wooded and very rocky. The natives on the lake possess small dug-out canoes, which they use extensively in their fishing operations. Leaving the lake, we continued still generally in a northerly direction through an uninhabited region covered with mimosa and other thorns, until we descended a deep depression and reached the outlying spurs of the Kamasia range of mountains. For the next five or six days we marched amongst these hills, following a small rocky stream known as the Karuan to its source, and here travelling was painfully slow, as the banks are densely wooded with thorns, and we were compelled to trudge along the bed of the river. At the source we crossed a low range of hills, from the pass of which we got a glorious view of the Suk plains, stretching away before us to the north and north-west, everywhere covered with a thick growth of mimosa and other trees. We took now a more westerly course towards the foot of the Elgeyo range, in order to reach the Suk settlement of Kivas.

* See map, p. 240, vol. xiv.

The river Kerio was crossed on October 10, and proved fortunately to be fordable, as I had feared it might be necessary to bridge it—an operation which Captain Pringle and I had to undertake in 1892, when we crossed it between Elgeyo and Kamasia far higher up, and there it was necessary to construct a 100-foot bridge to enable the caravan to cross. Our next march brought us to the first Suk settlement of Kivas, on the slopes of Elgeyo. Chemtulell and Weiwei, two other settlements, were passed on the following days, and Marich reached on October 14. Although these Suk had only once previously been visited by Europeans, viz. by Count Teleki and Lieut. von Höhnel, the natives at first were extremely suspicious of the advent of the white men, and discussed fighting us. However, better counsels prevailed, and they decided to make friends with us instead, and I was able to form a post at Marich, and leave a garrison there for a short time. The natives build their small hamlets high up on the hillsides, where they are secure from attack, whilst small plots of ground at the base of the hills are cultivated with mtama and Indian corn. These plots of ground are skillfully irrigated from the numerous small streams which course down the hillsides. The Suk are divided into two classes—the agricultural, who occupy the heights already referred to, possess only comparatively few flocks, and till the soil in consequence; and the pastoral, who live in the neighbourhood of the hills to the east bordering the valley of the Kerio. The latter are reputed to be very warlike, and possess, like the Turkana, numerous herds of cattle and flocks of goats and sheep; but we had no dealings with them, as they were out of our line of march.

From Marich, which is only some 3150 feet above sea-level, we followed a route hitherto untraversed by Europeans, in order to reach Save, on the northern slopes of Mount Elgon. We had found the road to Marich difficult for pack-animals, but it was incomparable to the difficulties ahead of us. We struck west now through a gap in the hills along the valley of the Muroni river. Our progress was exceedingly tedious, and after three long hard days we had only succeeded in covering a distance of 10 miles. The banks of the river were broken at intervals by steep rocky ravines, over which it was well-nigh impossible to take loaded animals. These had in consequence to be all unloaded, and their loads carried by porters sent back for this purpose. In addition, so dense was the vegetation of euphorbia and undergrowth that an immense amount of cutting had to be undertaken by those on advanced guard, to enable the animals and porters in rear to follow. As may be imagined, progress was most wearisome and slow, and yet, in spite of these trials, one could not but admire the beautiful scenery of this valley. Shut in everywhere by lofty peaks and ridges, the wild grandeur of this unknown valley would be difficult to surpass in any part of the world. Here and there small hamlets could be seen dotted high up on the hillsides on almost seemingly inaccessible peaks, the

inhabitants of which would visit our camp more from curiosity than for purposes of trade, as they had little more than a few pumpkins to hawk round the different tents. One eventful day we spent on a narrow mountain track, some 150 feet above the level of the rushing torrent below, the descent to which was almost sheer. Whilst jammed up along this track, owing to an obstruction on ahead, our ungainly camels became somewhat restive, and four of them, losing their foothold, rolled down with fearful momentum into the abyss below. Three of them fortunately landed into a deep pool, and were so little disconcerted by their terrible descent, that they calmly picked themselves up and proceeded to graze on the grass growing on the bank, in the most unconcerned manner. The fourth chose his spot with less discretion, and broke his neck in consequence, much to our grief, but to the delight of the Swahilis, to whom its flesh subsequently afforded an excellent meal.

On October 21 we made our last camp on the Muroni, which, flowing thence in a southerly direction, undoubtedly rises in Mount Chibcharagnani. For the next few days we still continued amongst the hills, until on the 24th we reached a deep rift, through which we saw extending away to the north a seemingly boundless plain, with a striking mountain in the foreground, the summit of which ended in magnificent rocky crags and bluffs. We had now reached the border of the great Karamojo plain, and the hill before us was Mount Debasien. We were clear of the hills once more, and the following day struck for the first time the river Turkwell, of which we were later to see so much during our journey to and from Lake Rudolf. Progress once more became easy and pleasant, as we traversed the grassy plain at the foot of the northern slopes of Mount Elgon.

Several fine streams were crossed during the next few days, until at length on October 30 we camped at the foot of the mountain, prior to our making the ascent to the fertile and thickly populated district of Save, situated on a plateau, some 2200 feet above the level of our camp. Our food was now exhausted, and the men had for some days past been kept on half-rations, owing to the delays and difficulties of the route through the hills. The following day, establishing a permanent post at the foot of the hill, in which a small garrison was left to look after the large quantity of stores and all our baggage animals, the ascent of the mountain was made. It proved to be a most exhausting climb, and as the men were worn out it was past 4 p.m. before the cultivated district was reached and a camp site selected. We were now at an altitude of over 6000 feet, in a most delightful climate and midst charming surroundings. The scenery everywhere was beautiful and grand, the country being well watered and cultivated, and the natives extremely friendly. The view from our lofty position away over the huge Karamojo plains was superb. To the north-west lay the marshy extent of country known as Kimama, whose main feature is the chain of small

lakes of which Mr. Jackson, who first discovered them, named the largest Lake Salisbury. These take the drainage of all the streams on the north-west of Mount Elgon, are connected with Lake Choga, recently explored by the late Captain Kirkpatrick, and so find their way into the Nile. Looking north, Mount Debasien stood out in solitary grandeur with its rugged crags and precipices, whilst away in the dim distance other mountain ranges were also visible to the north, whilst to the east a high range marked the continuation of the great Elgeyo escarpment. As Save could not supply sufficient food for our requirements, a fresh market was opened out some 12 miles distant, at Mbai, and this formed our main food-supply depôt for over a year.

About the middle of November the late Lieut. Macdonald also reached Save with a large column, having followed precisely the route of my column from Ngare Nyuki. He had intercepted a day or two before a letter sent by Colonel Macdonald, describing the fight at Lubwa's hill on October 19 against the Sudanese mutineers, and ordering me to bring down reinforcements to Usoga to assist in the operations against them. On November 16 and 19 two columns started for Lubwa's by a route to the east of Mount Elgon to Ketosh, and thence to Mumia's, where we were once more on the Uganda road. From Mount Elgon we had a foodless tract of country to traverse for ten days before reaching the fertile Ketosh country.

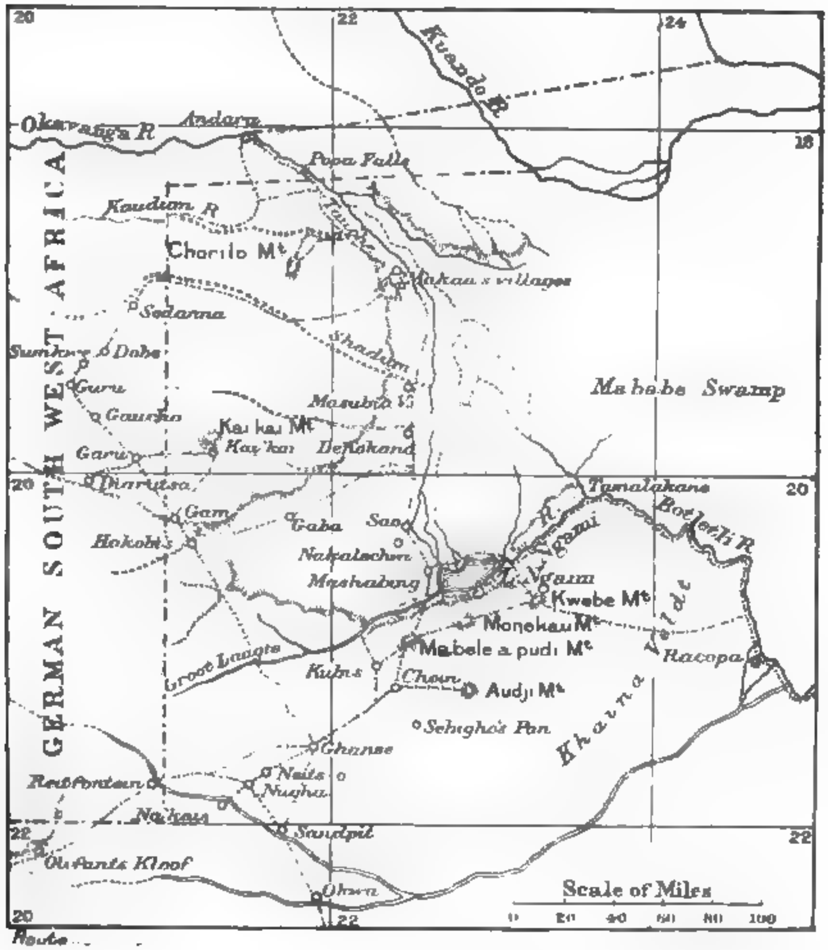
DR. PASSARGE'S JOURNEYS IN SOUTH AFRICA.*

In May, 1896, Dr. S. Passarge was engaged by the British West Charterland Company to investigate the geology and mineralogy of the company's concession in Ngamiland, in conjunction with the expedition which had set out earlier in the year under Colonel Lugard. The Kalahari had already been crossed from Palapye by the bulk of the expedition when Dr. Passarge reached that place, but the passage was made in company with an auxiliary expedition under Mr. Beddoe. The time of year—the close of the dry season—was most unpropitious, and the fact that, on account of the rinderpest, only donkeys and mules could be used increased the difficulties. Throughout the 250 miles between Palapye and the Botletli water is only to be obtained at isolated pans, the geological formation of which is of great interest. They occur where the country rock rises above the desert sands, and is hollowed out into cauldron-shaped depressions resembling craters. This rock is not usually limestone, as is the general impression, but more often sandstone, with perhaps a surface stratum of limestone. The longest interval without water was, at the time of the journey, 54 miles; but, as certain of the wells have since dried up, the distances are now much greater. During the passage Dr. Passarge was unfortunately attacked by inflammation of the lungs, so that scientific observation was out of the question. He makes, however, some interesting remarks on the relation which exists between the geology and the vegetation in the Kalahari. A comparison of different districts enables the eye to distinguish the various types of bush, uniform as this at first appears, and from its character

* Abstract of paper read at the Berlin Geographical Society, April 8, 1899.

to diagnose the nature, colour, approximate depth, proportion of earthy or vegetable matter of the soil; whilst a right understanding of the one science is impossible without a knowledge of the other.

The salt-pan of Nchokutsa, the first reached after the passage of the Kalahari, is one of the system in which the Botletli loses itself, and of which the great Makarikari is the largest. These pans are roundish or oval basins, varying from a mile or two to many miles in diameter, sunk to a depth of 30 to 45 feet in the



THE LAKE NGAMI REGION

sandstone. Their edges are well marked and often steep. The more central ones are often filled with water, or at least with reeds, while those at the outside of the system are dry; and only at the height of the flood in the Botletli (about August) are all the pans filled. Usually the floor is dry, and, the surface layer being loosened by the crystallization of the salt, the soil gives way at every step. On arrival at the swamps of the Botletli, the scenery changes entirely. Instead of the bare and yellow bush-steppe, the eye rests on green beds of reeds traversed by old river-

channels, whilst permanent settlements are for the first time met with. The original inhabitants of the "Litaka," or reeds, were a tribe of bushmen named Mateti or Matletle, who, in contrast to their kindred of the waterless steppe, dwell in the trackless swamps of the river. A similar division between swamp and steppe bushmen is met with on the Ngami and Taukhe.

The journey along the Botletli is by far the most agreeable part of a journey in Ngamiland. The river-bed is 150 to 200 yards wide, but the stream itself only 30 to 50. The banks are 25 to 30 feet high, and form steep white walls of sand compacted with lime, contrasting finely with the deep green woods and lighter masses of reed. Bird-life is abundant on the water, and animal-life was, till recently, plentiful on the banks, but the antelope species have been decimated by the rinderpest. Beyond the junction of the Tamalakane,* which is derived from the swamps of the Okavango, there is no longer a continuous stream, but only a succession of pools. Here permanent settlements are again met with, for the abandoned river-bed supplies the only ground suitable for agriculture. The population consists in part of Makoba, in part of bushmen who have become stationary. As to Lake Ngami itself, the water has entirely disappeared, and its place is taken by a brown expanse of reeds, between the roots of which the traveller sinks into the soft treacherous soil. Water can only be obtained from wells, as a rule about 20 feet deep, and the water is often brackish. Dr. Passarge, while attributing some influence to the progressive secular desiccation to which this part of Africa is subject, considers that the cause of the sudden drying-up of the lake was the blocking of the channel of the Taukhe by the thousands of reed rafts on which the tributary Makoba brought their yearly tribute of corn to the chief town of the Batauana. Even were the channel to be again opened, the drying process has gone so far that the Taukhe could hardly suffice to again fill the lake, whose shores are now abandoned by its inhabitants.

On arrival at the Kwebe hills, which had been chosen as the headquarters of the expedition, Dr. Passarge found Colonel Lugard with the main body already installed. The range is formed of several chains, consisting of quartz-porphyry. It was the first position occupied by the Bamangwato on their invasion of the country early in the century, and was formerly well supplied with springs, but now only a few water-holes remain. It rises like an island from the sand waste of the Kalahari, and its slopes are clothed with thick wood, resembling in many ways that on the river-banks. The baobab grows in exceptional numbers, the whole hillsides being covered with them, with very small intervals. From the Kwebe hills Dr. Passarge made geological excursions in all directions, many of them for the purpose of detailed geographical and geological surveys. The most interesting was that which led north from Ghanse to Andara on the Okavango. The first permanent water in this direction is at Gam, about 130 miles from Ghanse, and it had been impossible for several years to reach this point on account of want of rain; its position also was imperfectly known, though there existed an old road, much over-grown, which had been originally made by a Boer named van Zeyl, and subsequently utilized by the trek Boers.

The first stage was at a dry river-bed—the "groot Laagte"—which forms in its lower course the Bell valley of Baines and Chapman. It must once have carried

* Dr. Passarge says that this is not really the name of the river, but of the district, all the native nomenclature being based on a subdivision of the country into such districts. The separate settlements are known after the chiefs, and are therefore subject to change, whereas the district names are as a rule invariable, remaining constant even in the case of a change in the population.

a body of water comparable to that of the Okavango of the present day. Trusting to the bushmen for guidance, and experiencing heavy rain *en route*, Dr. Passarge reached Gam in six days, in advance of his party. Provisions falling short, he made his way eastward to Ngami and Kwebe to procure a fresh supply, but, on again reaching Gam after many delays, found that his expedition had proceeded in advance to the Taukhe. After exploring the neighbourhood of Gam, Dr. Passarge made his way with difficulty, owing to the ignorance of the bushmen as to the country outside their own district, to Sodanna on the Shadum, where the old route of von François was joined. Thence the party proceeded eastwards to the Taukhe, traversing a distance of 70 miles through thick bush, instead of the 10 shown on the maps. Andara and the Popa falls were then visited. Below these falls the river-bed widens out funnel-fashion, breaking up into arms which form extensive reed and papyrus swamps, broken by wooded islands. Southwards the swamps constantly increase in extent, which, however, must formerly have been still greater. The road to Ngami leads by a network of dry river-channels through a district described as the granary of Ngamiland. The Batauana town Tsao was reached in July, 1898, and in the following October Dr. Passarge set out on his homeward journey.

REPORT ON THE INDIAN SURVEYS, 1897–98.

The Indian Survey Report, an early copy of which has just reached England, always contains interesting details of various scientific operations carried on by the Department over a very large field, often extending far beyond the frontiers of India itself. The period covered by the present report is the year ended September 30, 1898, and one of the first events chronicled is the attack made in Makran on the single party under Captain J. M. Burn, R.E., to whom was entrusted the duty of extending the main Indian triangulation westwards towards the Persian border as a basis for future surveys. Makran is a forbidding region, though one of great strategic and political importance, and it is doubtless owing to its being still very imperfectly opened up and occupied that the natives are so refractory. Captain Burn's main camp was attacked and looted, and thirteen men were killed, besides Rs. 15,000 being carried off. Captain Burn, who had been suffering from fever, was fortunately encamped on the top of a hill at a little distance from the main camp, and he and the men with him escaped with their lives, but with difficulty and hardships, as they were about 130 miles from the nearest European station. Other members of the party also managed to reach the coast in safety, but four poor fellows forming a "lamp squad" took refuge in a fort, and were killed by the natives. The punitive measures instituted by the Indian Government do not find record in the Survey Report, but it may be here recalled that Colonel Mayne was despatched to the scene with a small force, and completely routed Baluch Khan and 1500 of the rebellious tribesmen on January 31, 1898. As postal stations and trade routes have since been opened in Makran and Baluchistan, risings of this sort will be presumably rare in future.

The field surveys of the year 1897–98 were carried on by two double and seventeen ordinary parties, who were employed on trigonometrical, topographical, forest, cadastral, and traverse surveys. The aggregate survey on all scales amounted to 36,199 square miles, of which 9976 square miles were reconnaissance only. The total compares very unfavourably with that of 104,987 square miles, achieved in

the previous year, the decrease in 1897-98 being due to the small amount of reconnaissance completed in the latter season.

As for topography, three parties were engaged in the Shan States, where the hilly and intricate country, covered with tree or scrub jungle, made progress a very slow and costly matter. Most of the officers and men were much liable to fever. In accordance with a programme laid down during the previous year, a survey of the Lushai hills in Assam was commenced under Major Hodgson. No great trigonometrical survey stations exist here, so a series of first-class secondary triangles was started from the Eastern Frontier series, eventually closing on to the same series near Rangamati, in the Chittagong hill tracts. The stations were selected beforehand with the aid of the maps and charts of the previous surveys during the military expedition of 1871, and in 1889. The hills consist of high parallel ranges running generally north and south, and divided by deep valleys. The Lushai villages are generally perched on the tops of hills or on projecting spurs, and in the dry season the water-supply is often a great distance away. They are abandoned every four or five years, when a whole village community will move to a fresh site, build a new village, and make new clearances. Permanent villages are thus unknown, and no steps have been taken to mark the villages as such on the maps.

Tidal observations were taken at thirteen stations between Suez and Port Blair, and the predictions of results at the open coast stations were satisfactory, 70 per cent. of them being within fifteen minutes in time, and 94 per cent. within 8 inches in height of actuals.

The survey operations carried out in connection with the Burma-China Boundary Commission during 1897-98 are described at some length by Major F. B. Longe, R.E., and Captain T. F. B. Renny-Tailyour, R.E., who were deputed with the southern and northern sections of the commission respectively. The operations grew out of the Convention concluded in 1894 between Great Britain and China, whereby the boundary between Burma and Yunnan was defined. The Chinese Government, however, failed to abide by the stipulations, and after further negotiations an "Agreement" was signed in Peking on February 4, 1897. Both convention and agreement had to be annulled by the Joint Commission, and owing to mistranslation in the Chinese version, and to the absence of proper instructions from the Tsungli-Yamen, endless trouble arose.

The two commissions, British and Chinese, met at Bhamo, and after a good deal of discussion it was decided that the whole party should divide into two sections, one, consisting of Mr. E. George, C.I.E., and Chen, the magistrate of Milo, going northward, and the other, under Mr. H. Thirkell White, C.I.E., and General Liu, proceeding southward. The latter proceeded to the frontier, and established a camp at a spot called Lwe Leing, on the banks of the Nam-pa-kha, where the embassies from Burma to China in former days used to be met by the Chinese authorities, and where the escorts were changed, the meaning of the name being "the place where presents are given." Here intelligence was brought that neighbouring Kachins were assembling to attack the British camp; so, after a conference with General Liu, a move was made to Lwe Long, where the party were in heliographic communication with Bhamo, and where they remained till the camp broke up in April. Early in February one of the most powerful of the local Sawbwas proceeded to erect stockades to bar the British advance, and, General Liu having declared that it was within the rights of the villagers to take any means they pleased to protect their villages, a warning was addressed to the Sawbwa, and the Government of Burma was communicated with. A detachment of military police, under Lieut. Langtry, arrived from Bhamo and carried the stockades, the Chinese

being put to flight, with the loss of seven dead, twenty-five prisoners and nine standards being left in the hands of the British.

The Commission broke up on April 2, having achieved no settlement of the points in dispute, though Major Longe was enabled to do a considerable amount of survey work, and a great deal of triangulation was carried out and computed, so as to fix points and get a general knowledge of the country for the ensuing season's work.

The country through which the southern section worked lay between the Taping on the north and the Namwan on the south, the direction of the streams being south-west. The hills are very steep and rugged, the valleys deep and little cultivated. Having been for time immemorial subjected to the devastating system of *taungya* cultivation, the hills are much more bare of real forest than one would expect.

Water is abundant, though it is curious that no fish exceeding an inch in length was ever observed! Game was not abundant, but by dint of great perseverance Mr. Warry, the Chinese adviser, secured a few silver pheasants, bamboo partridges, and francolin. Sambhur and barking deer are to be had, but are rare. A fine bear was killed close to the camp at Lwe Long.

The northern section had to survey and demarcate the boundary from where the Nampaung river joined the Taping river northward to a high peak, the approximate position of which was supposed to be lat. 25° 35', and long. 98° 14' E. The country was not well known, and the Chinese commissioner protested he could not go the whole way, as he could ride "no better than a turtle." In spite of many difficulties raised by the Chinese, 4750 square miles were triangulated, 690 square miles were surveyed on the 1-inch scale along the boundary, as well as 1960 square miles on the $\frac{1}{4}$-inch scale. Captain Renny-Tailyour also carried the triangulation throughout, and observed from twenty stations and fixed 132 intersected points, including as many distant hills in China as possible.

THE MONTHLY RECORD.

EUROPE.

Minima of Temperature on British Mountain-tops. — Since the winter of 1867–68 a regular record of the minimum winter temperature on the Glyder-fach, near Snowdon, has been kept, first by Mr. H. B. Biden, and after his death by Mr. Piffe Brown. In reprinting the table lately published by the latter in the *Climbers' Club Journal*, the editor of *Symons's Monthly Meteorological Magazine* calls attention to the contradictory nature of the evidence we at present possess with respect to such temperatures. The minima on the Glyder-fach (3262 feet) were far from so low as might have been expected, the average for the twelve years 1884–96 being 14°·7 Fahr., and for the whole series of years from 1867, 16°, while the lowest recorded temperature was 8°. At Llandudno, at a height of 90 feet, the twelve years' average was 23°·6, giving a difference of only 8°·9 between the two stations. The same average on Ben Nevis (4407 feet) was 7°·5, and at Fort William (35 feet), 17°·3, a difference of 9°·8. On the other hand, the minimum temperatures for the summit of Scafell Pike, as recorded by Dr. J. F. Miller in 1848–50, are extraordinarily low in many cases, 31° *below zero* being registered in January and February, 1850, while other minima considerably below the same point are also recorded. The desirability of renewed efforts to ascertain the facts is, as the editor remarks, beyond question.

Recent Glacier Investigations.—At a meeting of the Vienna Geographical Society in November last, Prof. E. Richter, President of the International Glacier Commission, delivered an address * on recent continental researches on the motion of glaciers and the problems connected therewith which still await solution. After touching briefly on the early labours of Agassiz, Forbes, Faraday, and others, and the new impulse to the study given by the formation in 1869 of a glacier-commission of the Swiss Alpine Club, the speaker dwelt on the researches of Forel on the oscillations of glaciers, which he explained by the variations in the mass of the flowing ice, this being subject to the same law by which a deep river flows more rapidly than a shallow one of the same breadth and fall. The speaker himself had extended this law by a study of the interval of time which elapses between the accumulation in the region of the *névé* and the beginning of the advance at the glacier snout, holding that under the action of the increase in volume of the upper portion of the frozen stream, an advance of the snout takes place *long before* any particle of ice can reach it from the augmented masses in its rear. A further contribution to the subject was supplied by Brückner's researches on changes of climate, together with the demonstration by Richter that the Alpine glaciers had, during the last three centuries, shown a tendency to advance, roughly speaking, every thirty-five years. Increased attention has been paid within the last few years to glaciers marked by a sudden advance with devastating action, such as, among others, the famous Vernagt Glacier in the Tirol. This has shown that it is impossible, without the most accurate mapping of the environs of the glacier, and constant revision of the same, to determine the cause of the phenomenon and the proper means of protection against its catastrophic action. Of great interest also, in connection with the study of glaciers, were the contributions of Ratzel and his school towards a more correct definition of the idea of the "snow-level," extended by the work of Penck, Brückner, and Richter himself. The last named had already refuted the current notion that the snow-limit rises in the Alps from west to east, by showing that in the eastern Alps it lies at a comparatively low level on the northern and southern margin of the range, but rises in altitude towards the more temperate central portion. Recent investigation has shown that an extreme difference of at least 2000 feet occurs. Although this depends partially on the greater dryness of the interior parts of the range, Prof. Brückner has supplied the true explanation by showing that, during the warmest hours of the day, the same temperature is found at a much higher level in the centre than on the outskirts of the Alps. The speaker laid particular stress on the value of the results obtained by Finsterwalder in his endeavour to apply a geometrical treatment to the question of glacier motion. It has led him to propound a new theory of moraine motion, which supposes the material collected at the upper end of the *névé* to be covered by successive layers of snow during its passage downward, so that it finally becomes incorporated with the ground moraine. The study of glaciers has now reached a turning-point, and Prof. Richter thus formulates the principal problems brought to the front by recent research: (1) The determination of the relation which exists between the cessation of a glacier's advance and the rate of motion of the ice; (2) the resumption of the study of physico-thermal questions, preceded by a clear definition of terms.

ASIA.

Steam Navigation on the Upper Yang-tse.—The subject of the navigability by steam-vessels of the rapids of the upper Yang-tse has lately been fully

* The report of Dr. Richter's address appears in the first number of a new publication commenced this year, under the title *Abhandlungen der K.K. Geographischen Gesellschaft in Wien.*

discussed by Father Chevalier, S.J., in a brochure published at the Zi-ka-wei observatory at Shanghai. His remarks are based on a survey of the rapids executed by him during a voyage to Ping-shan on the upper river, the results of which will eventually be published at the same observatory in an atlas of sixty-five sheets, with explanatory letterpress. One of the sheets, and extracts from others, are issued with the present brochure, and, besides elucidating M. Chevalier's description of the principal rapids, they are an indication of the value which will attach to the completed work. The charts are on the large scale of 1 : 25,000, and show a complete series of soundings as well as minute details as to the nature of the river-banks and the position of rocks and sandbanks. After quoting the unfavourable judgment pronounced by Lieut. Dawson after his examination of the rapids in 1869, M. Chevalier gives reasons for not considering this verdict final, and carefully examines the separate rapids with reference to the special difficulties to navigation which they present. During his voyage he carried out an extensive series of soundings, the lead being cast every three minutes during the passage from Sui-chau to Ichang. The result is to show that a sufficient depth is everywhere present, even at low water, no sounding giving a depth less than 4 metres (13 feet), while at mean level the passage can be made by vessels drawing from 6 to 7 metres (20 to 23 feet). Again, no really torrential current was experienced during the voyage, nor any bar across the stream, nor any narrows with a pass less than 100 yards wide. At two places only does M. Chevalier see a difficulty in the way of a vessel ascending by steam power only, and in these cases he thinks that an iron cable attached to the bank and hauled upon by the steam-windlass would enable it to be surmounted. The three most dangerous rapids are the Sin Tan, or new rapid of Yun-Yang, the I Tan, and the Sin Tan of Kwei-chau. The first named is that which owes its danger to the landslip which occurred in 1896. This greatly narrowed the navigable channel, but it is still over 100 yards wide, and as the current has been carefully estimated at not over 6 knots, it should prove no insurmountable obstacle. M. Chevalier urges the importance of a trained service of pilots thoroughly acquainted with the state of the channel at each of the rapids.

Trans-Siberian Railway.—The idea of establishing across Lake Baikal a communication by means of powerful ice-breakers upon which whole trains would be carried over the lake has been abandoned, and work has begun on the railway around the southern shore of the lake.

AFRICA.

Livingstone's Tree.—It will be remembered that when Mr. Weatherley, in 1896, visited the spot where Livingstone died, he reported that the tree which marked the spot, and on which the commemorative inscription was cut by the great traveller's followers, was in such a state of decay that it must fall before long, and the inscription be lost for ever. After the reading, before our Society, of Mr. Weatherley's paper, the suggestion was made by Mr. Alfred Sharpe that steps should be taken to cut out the section of the tree containing the inscription, and bring it home to be kept with other Livingstone relics. After Mr. Sharpe's return to Africa arrangements were made to carry the idea into execution, and Mr. R. Codrington started in April last from Fort Jameson to visit the site of Chitambo's village, and carry out the necessary measures. Writing on June 19 last, Mr. Sharpe informs us that the expedition has been successfully accomplished, Mr. Codrington having arrived at Ikawa, one of the Chartered Company's stations on the Tanganyika plateau, bringing the section with the inscription. This news was received by telegraph, but Mr. Sharpe had previously received news of the arrival

of the party at Chitambo's, together with the Journal kept by Mr. Codrington *en route*. This he has kindly forwarded to us, and from it we take the following details respecting the journey. From Fort Jameson, between Lake Nyasa and the Loangwa river, Mr. Codrington proceeded west, passing though much uninhabited but well-watered country, broken by some hills, to the Loangwa, which was crossed near Sunda's village. The river was only 4 feet deep at the deepest part, and 350 yards across. Mr. Codrington made use of a folding boat for the passage, which proved satisfactory. The Muchinga range was crossed near Chilenga, the greatest altitude of the path being 4950 feet, though some peaks rise to 5500 feet. The ascent was steep, with occasional ledges, and the hills were covered with msuku forest. Passing near Moir's lake, the expedition traversed a level rolling country with light forest and some stray kopjes. The Molembo was crossed, and later the Lohombo, a deep stream 30 yards wide with steep banks. It rises near the Irumi hills, and flows to the Luapula.* Chitambo was found to be an intelligent man, about thirty years old; he succeeded his father, who died in the same year as Livingstone, and was buried under the same mpundu tree which sheltered the explorer's remains. The chief acted as guide to the spot, and the men were set to work felling the tree, which proved very hollow inside. The inscription (which we reproduce) was partially defaced by borers, etc., so that it is fortunate that it

D[R] LIVINGSTONE

MAY 4, 1873

. . . . . . ZA MNIASERE

UCHOPERE

has been secured without further delay. The section when cut proved too heavy, and had to be much reduced in size to form a practicable load, but this was at last accomplished. The tree, which is of the kind known about Blantyre as mpembu, was too old to produce seeds. The spot on which it stood was temporarily marked by an iron telegraph pole. Throughout the journey Mr. Codrington made observations for altitude with boiling-point thermometer, and his companion, Mr. Leger, made a careful map. The return was accomplished *viâ* the Chambezi and the Awemba country.

Captain Wellby's Explorations in the Lake Rudolf Region.—Writing to the Society on July 15 from Omdurman, Captain Wellby announced his safe arrival at that town after a most successful journey. After traversing the southern districts of Abyssinia (*Journal*, vol. xiii. p. 553) and satisfying himself that the Omo flows into Lake Rudolf, he had struck south along the east shore of the lake, but an attempt to explore the country further east failed owing to the loss of more than half his transport animals. For a distance of 30 or 40 miles east of the lake not a drop of water was found. Passing Teleki's volcano,† the expedition struck west for about 130 miles, and then travelled north about midway between Lake

* The Lohombo was crossed for the second time 16 miles from Chitambo's, and must therefore join the Molembo much further to the east than is shown in Thomson's map.

† Mr. Cavendish reported that this volcano had entirely disappeared. Possibly Captain Wellby refers to the new crater, said to have opened out 3 miles further south, which was, however, only about 130 feet high in 1897.

Rudolf and the Nile, through a fine country well wooded and abounding in game. It consists of a succession of well-watered valleys and ranges of hills running north and south. A small river called Ruzi (possibly the name means "river"), coming from a long distance south, flows into the stream called Juba on recent maps. Eventually Captain Wellby reached the Anglo-Egyptian fort at Nasser, on the Sobat, in the neighbourhood of which, owing to the swamps, sickness for the first time prevailed among his men. During the journey plane-table work on the scale of 4 miles to the inch was carried out by Dafadar Shahzad Mir, whilst Captain Wellby took observations for latitude, height, and temperature. Friendly relations were maintained throughout with the natives, of whom a great variety of tribes were encountered. The Turkana were found to be a very fine race, many of them approaching a height of 7 feet. They wear a mass of matted hair hanging down their backs to the waist, and in it they carry their tobacco and various knick-knacks. Owing to a dearth of boats, Captain Wellby would be forced to remain three weeks at Omdurman, which he describes as a clean and healthy place, thanks to the energy of the authorities.

M. Fourneau's Expedition in the French Congo.—The expedition under M. Fourneau alluded to in the May number of the *Journal* has since made its way successfully from the upper Sanga to the coast by way of the Komo, a tributary of the Ogowe. The land journey is said to have led in part through thick forests inhabited by Pahuin cannibals.

The Depth of Lake Nyasa.—We have received a telegram from Mr. J. E. Moore, in command of the scientific expedition to the Central African lakes, announcing, as the result of his soundings in Lake Nyasa, that the greatest depth amounts to 430 fathoms. Although it has been known, since the first exploration of the lake by Drs. Livingstone and Kirk, that great depths exist, all previous attempts to discover the actual maximum have failed through the insufficient length of the sounding-lines. In the paper presented to the Society by Mr. Alfred Sharpe in 1896 (*Journal*, vol. vii. p. 368), some account was given of the results of Lieut. Gurney's soundings, which showed that a considerable area in the northern half of the lake exceeded the depth of 300 fathoms, which was the maximum length of wire possessed by the gunboats. Great depths have been found, too, at the extreme northern end, but the southern end appears to be shallower, though, according to Dr. Cross (*Journal*, vol. v. p. 123), no bottom has been found here with a line of 200 fathoms. Lieut. Rhoades's map (*Journal*, vol. xii. p. 648) shows a considerable number of soundings, but these are mostly in the vicinity of the shores and in the southern half of the lake. The deepest inserted on the map lies off Deep bay, in the north-west of the lake, no bottom having been found at 100 fathoms.

Map of Lake Nyasa.—Lieut. Rhoades writes with reference to the notice of the map of Lake Nyasa by himself and Lieut. Phillips, p. 580, vol. xii. of this *Journal*, that his longitudes were not taken from Mr. O'Neill's longitudes of Blantyre. They were worked back from Natal, where he got Greenwich mean time and found his rate to correspond with the rates he got on the lake. His longitude of Nkata bay, midway up the lake, is the same as that made by the Boundary Commission from Cape Town. It should be stated that Lieut. Rhoades did the work entirely at his own cost, having had to purchase his own chronometer (one of Blockley's) and instruments.

Mr. Weatherley's Explorations in the Bangweolo Region.—Towards the end of last year Mr. Weatherley continued his explorations in the region of Lake Bangweolo, again making use of his boat, the *Vigilant*, in which he had previously made the tour of the lake. After descending the Luapula for a few miles from its

exit from Bangweolo, the traveller crossed over a strip of firm ground named Kapalu, covered in the forest, which separates that stream from Lake Kampolombo. The latter is separated from Bangweolo by a tract of marshy ground, but seems to have formerly occupied a larger area. Two other marshy lagoons communicate with it.

French Expeditions in the Western Sudan.—During the past year the French have been actively extending their operations in the region east and south of Timbuktu, and geographical results of some importance have been obtained by the expeditions sent out. That under Captains Voulet and Chanoine set out last year in two detachments, the one under Captain Voulet descending the Niger past Timbuktu, the other under Captain Chanoine striking across the bend of the river by land from Jenne, on its western limb. According to a brief account in the *Comptes Rendus* of the Paris Geographical Society, the latter column made its way, by a pass between Yarro and So, across the mountain range of Bandiagara, which, with a total length of over 600 miles, extends northwards beyond Hombori to the Niger, and even further. It forms a well-marked line of division between the basin of the upper Niger and those of the middle Niger and the Volta. The mountains are inhabited by the Tomas, a black race named Habe by the Fulbe. Descending the mountains, Captain Chanoine proceeded east-south-east to Wahiguya, in Yatenga, and afterwards reached a vast sandy plain named Seno, badly watered, but covered with trees. Passing subsequently through a marshy tract at the sources of the two Voltas, he reached Wagadugu, whence he proceeded to Say. Then ascending the Niger, he, on January 2, effected a junction with Captain Voulet's force, which had successfully descended the river, at Sansanne Hausa. The latest news to hand with regard to the united expedition is summed up in the July number of the *Bulletin du Comité de l'Afrique Française*. Hostilities broke out between the mission and the Tuareg, which, however, ended in the triumph of the French. Accusations of undue severity in the treatment of the natives having been made against MM. Voulet and Chanoine, the investigation of the matter has been entrusted to Colonel Klobb, who will, in case of need, take over the command. The number of the *Comptes Rendus* above alluded to also contains some details respecting the expedition for the exploration of the upper Kavalli under MM. Hostains and d'Ollone, to which reference was made in our August number. Starting from Bereby rock, on the Ivory Coast, in order to avoid the hostilities on the lower Kavalli, the party reached, on March 15 last, the Duo river (apparently the Diwu of Blondiaux), which unites with the Duobe to form the so-called Kavalli —a name unknown to the natives. The Duo comes from the east-north-east, but makes a bend to the north-west. It receives an important tributary named Hanna. The expedition was about to push further northwards, where, however, the tribes were described as hostile.

The Béhagle Mission to Lake Chad.—News of this expedition, dated January 1, 1899, is published in the May number of the *Comptes Rendus* of the Paris Geographical Society. At the date mentioned M. de Béhagle was at the source of the Gribingi (which, according to a sketch-map accompanying the note, lies in about 6° 20′ N., 20° 5′ E.), having surveyed the whole course of the river between 6° 20′ and 8° 40′ N. Previous information (*Comptes Rendus*, 1899, p. 60) had stated that he had surveyed both the Gribingi and Shari to 10° N., as well as the Bamingi, the principal branch of the Shari, for ten days' journey above the mouth of the Gribingi. In the sketch-map above alluded to (by M. de Béhagle himself) the lower course of the Gribingi appears as a dotted line, while there is a break in the itinerary between the upper Gribingi and the Bamingi, so that it is not clear by what route the latter was reached. During a reconnaissance in the

country east of the Gribingi. M. de Béhagle seems to have approached the upper basin of the Bamingi, having crossed the Paima, one of its western tributaries; he also speaks of having discovered holes and fissures in the felspathic rocks at Nembrua (not marked on his map) which may possibly have served as habitations of the natives in former ages. During the journey from the Ubangi, the upper course of the Tumi and the country to the west of its source were explored by M. Mercuri.

Geographical Work in German East Africa.—Several items of interest as regards the geography of German East Africa appear in the first two numbers of the *Mitteilungen aus den Deutschen Schutzgebieten* for the present year. The first number contains a fresh instalment of the careful astronomical observations of Captain Ramsay during his journeys east and north of Tanganyika in 1897. They are almost entirely confined to latitudes, only two trustworthy values for longitude having resulted from the lunar observations. The various observations for latitude agree well as a rule, and the mean error during the journey rarely appears to exceed $\pm 0'.2$. A large number of observations were taken for the latitude of Ujiji, the mean result (obtained by taking the average of the daily means) being 4° 55′ 6″ S. Herr Ambronn (by whom the results are computed) notes, however, as difficult of explanation, that the daily means show a progressive diminution in value. Another careful series of observations, for latitude, magnetic declination, and altitude, was carried out by Dr. Maurer between the coast and Kilimanjaro. The altitudes were determined by aneroid, checked by frequent boiling-point observations, and compared with simultaneous observations at Dar-es-Salaam. A large number were taken at various points on Kilimanjaro up to a height of 15,350 feet, at which altitude patches of snow were lying in sheltered spots on March 2. Other observations give the altitudes of the various changes in the character of the vegetation, etc. The same number contains a large-scale map of the island of Ukerewe, in the Victoria Nyanza, from a survey by Captain Herrmann, who made the complete circuit of the island by land as well as a journey across the eastern end. The outline, especially in the west and north, receives some considerable modifications. The whole interior of the island (which is 25 miles long, with a maximum breadth of about 12) consists of wooded hilly country, quite uninhabited, rising to a height of about 650 feet above the lake. In the west the flora has West African affinities. Formerly elephants were met with in large numbers, but now that the channel to the east has become unfordable only three remain. Captain Herrmann has also executed detailed surveys in Bukoba, west of the Victoria Nyanza, and a large-scale map of the northern part of the district, south of the lower Kagera, appears in the second number of the *Mitteilungen*. In the north-east the survey is said to be complete both as regards surface features and localities, while the shores of the lake were plotted in both from the land and the water. Captain Herrmann carried his survey on both sides of the Ngono, a southern tributary of the Kagera which flows for a long distance parallel to the lake-shores with an interval of only 4 miles. He has also completed the survey of Lake Ikimba. The whole country east of the lower Kagera is intersected with swampy steppes separated by ridges of higher ground. These, like the higher parts of the country generally, are largely covered with banana plantations, while large patches of forest with West African flora occur at a lower level. The mouth of the Kagera does not, as has been supposed, enter a bay, but forms a delta projecting far into the lake. Captain Herrmann has been transferred to Tabora before completing his map of the country, one of the principal points requiring examination being the contour of Lake Urigi, which, he says, differs considerably from that shown by Stanley.

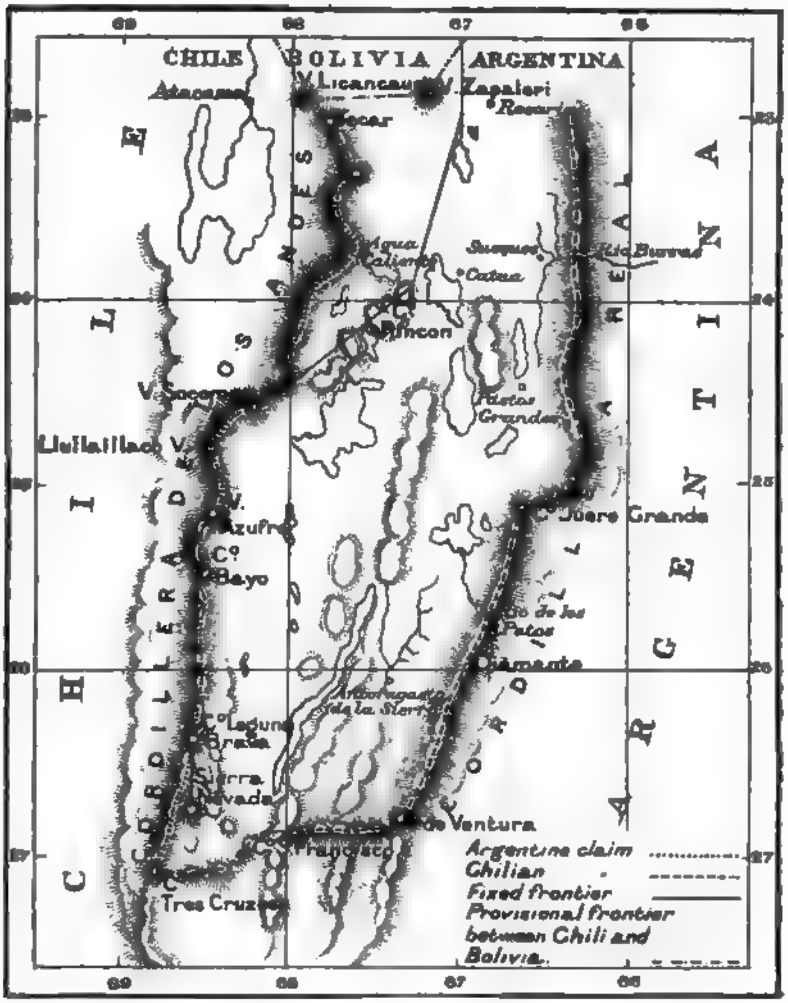
AMERICA.

Twelfth Census of the United States.—The arrangements made for the taking next year of the twelfth census of the United States are summarized in the *Bulletin* of the American Geographical Society (No. 2, 1899). The Director will be Mr. W. R. Merriam, of Minnesota, while the services of Messrs. Wines and Gannett, who took part in both the tenth and eleventh censuses, have again been secured. The other co-operators include Prof. Willcox, of Cornell University, who will ultimately devote his attention largely to the discussion of results and their presentation in form most useful to scientific men. Elaborate plans have been made for the execution of the enumeration, which will be carried out by an army of over 30,000 officials. Operations will begin in June, 1900, and the enumeration must be completed for the cities within two weeks, and for the county within thirty days, while the volumes must, according to the Act of Congress, be published within two years, so that the utmost efficiency on the part of the staff will be necessary. Probably over 3000 clerks will be employed at Washington.

Alaskan Exploration.—We learn from the *Bulletin* of the American Geographical Society (No. 2, 1899) that the scientific exploration of Alaska is being resumed this season, two parties having been sent out for the purpose. The one consists of Messrs. Peters and Brooks (as topographer and geologist respectively), who were to travel north-west along the base of the St. Elias range to the head-waters of the Copper river and Tanana, connecting their work with that effected last year. The other, consisting of Messrs. Schrader and Gerdine, hoped to explore the Koyukuk and other streams north of the Yukon.

The Argentine-Chilean Boundary in the Puna of Atacama.—In the boundary agreement of 1896 between Chile and Argentina, a distinction was made between the portions of the line north and south, respectively, of 26° 52′ 45″, the final decision south of that parallel being referred to Her Majesty's Government, while to the north, as far as 23°, the question was placed on a different footing, the concurrence of Bolivia being requisite. Between 23° and 26° 52′ 45″ the Argentine claim embraced all the country as far west as the high main chain of the Andes, considerably west of Zapaleri, on the provisional Bolivian-Chilean boundary of 1896. Chile, on the other hand, claimed the whole tract between the main Cordillera and the continuation of the Cordillera Real of Bolivia, the proposed line turning sharply to the west at the Pato de Ventura, towards the pass of San Francisco and Mount Tres Cruzes. The attempts of the Commissioners to arrive at an agreement proving unsuccessful, the decision was placed in the hands of Mr. Wm. Buchanan, U.S. Minister in Argentina, with one representative of either country. The decision was given last spring, and resulted in assigning to Argentina the greater part of the contested territory. The boundary-line is fixed as running through a large number of summits and other points in the neighbourhood of the main Cordillera, starting from the intersection of the 23rd parallel with the 67th meridian, the principal points mentioned being the Cerro de Rincon, the Volcano Socompa, Mount Llullaillaco, the volcano Azufre or Lastarria, and Mount Aguas Blancas. The last point fixed towards the south is the summit of the Sierra Nevada, as shown on the Argentine map, with the altitude of 6400 metres. From this point a straight line will be drawn to that point on the parallel of 26° 52′ 45″, which shall eventually be fixed by Her Majesty's Government. The country lying between the two Cordilleras, which has been the subject of the recent difficulty, is a high plateau with large salt lakes and numerous volcanoes, some still active, and possessing mines of gold, silver, copper, and nickel, as well as alluvial gold. Borax is also obtained.

The pastures are poor, and small numbers of llamas, goats, sheep, and mules are reared at a few places only.



THE NORTHERN ARGENTINE-CHILEAN BOUNDARY.

Re-measurement of the Arc of the Meridian of Quito.—At the International Geodetic Conference held at Stuttgart last year, it was laid down as desirable, at the instance of the American delegate, that the measurement of the equatorial arc of the meridian, in the neighbourhood of Quito, carried out last century by MM. Bouguer, La Condamine, and Godin, should be revised with the greatest accuracy possible by the help of modern methods. The idea has been taken up warmly in France, and a Committee appointed to consider the question resolved last January to recommend the project to the consideration of Government, suggesting as desirable the measurement of an arc of 5° to 6°, so that the result might

admit of comparison with similar operations, now being carried out in the Old World. The despatch of a preliminary expedition was recommended, and on May 15 last the announcement was made to the Paris Academy of Sciences that the French Government had entrusted the task to Captains Maurain and Lacombe, experienced officers of the geodetic section of the Service Géographique. They are commissioned to execute a general reconnaissance of the ground, and to collect all the information necessary for the due prosecution of the enterprise.

Dr. Herrmann Meyer in Central Brazil.—A letter from Dr. Herrmann Meyer, printed in the *Verhandlungen* of the Berlin Geographical Society (Nos. 5. and 6, 1899), gives an account of that traveller's movements down to March last. Dr. Meyer was then at Cuyaba, about to set out for the more serious part of his journey, but he had already travelled extensively in the southern provinces of Brazil, and gives useful information regarding the present state of affairs in them and also in Mato Grosso. He had visited all the German colonies in the south, and reached the military colony of Alto Uruguay and the district of Misiones, forming satisfactory conclusions as to the suitability of the country for colonization and the prospects of the proposed upper Uruguay railway, the surveys for which have already been begun. He had also paid a visit to the Detale Indians on the Rio de Varzea, but found that they had retained little of their original character, having become much mixed with the Negro stock. At Nonohay, on the upper Uruguay, and in several other localities, there are settlements of the same race, which is said to be related to the Caingang of Parana and Santa Catharina. From Pelotas, in the south of Rio Grande, Dr. Meyer went overland to Montevideo, and then *viâ* Buenos Aires to Diamantino and Cuyaba. Here he found that much activity had lately prevailed owing to the attempts to open up the rubber trade, but several expeditions had met with disaster. Captain Duarte and several companions had succumbed to fever while on a journey down the Arinos, a tributary of the Tapajos. Colonel Castro had sought in vain for the legendary "Martyrios" mines, but had been shown a supposed ancient burial-place of the Indians near the Kulisehu. He was about to start anew in search of the old mines of Arayes. Two Americans, named Williamson, had gone to the Xingu by the Kulisehu, but had not since been heard of; while, lastly, an Italian, Dr. Pasini, had descended the Arinos and Tapajos in company with a surveyor, and had made an accurate chart of those rivers down to the Salto Augusto. Dr. Meyer hoped to obtain for publication some account of their journey. He had been already engaged on anthropological researches, and his preparations for his journey to the Xingu were completed. He hoped to announce its successful termination by the end of the year, either from Cuyaba, Goyaz, or Para.

Dr. Krüger's Explorations in Patagonia.—Dr. Paul Krüger, who, like Dr. Steffen, has devoted several seasons to the exploration of the Andes of Patagonia from the Chilian side, describes briefly his latest expedition in a recent number of the *Verhandlungen* of the Berlin Geographical Society (1899, Nos. 5 and 6). It will be remembered that for some time past a problem has existed as to the ultimate destination of the Futaleufu, a stream which occupies an important longitudinal valley in the portion of the Cordillera cut by the 43rd parallel of south latitude. Dr. Krüger's exploration of the Corcovado in 1898 proved that the latter stream has no connection with the Futaleufu, as had before been thought probable. On the other hand, it had been suggested, though Dr. Krüger did not share the opinion, that the Futaleufu joined the Palena. This uncertainty has been set at rest by Dr. Krüger's latest expedition, on which he spent some six months during the season of 1898–99. He directed his attention to the Rio Yelcho, the importance of which he had for the first time demonstrated during the previous year. Its mouth is in 42° 54′ S. lat., where it forms a large delta with many channels, of which the

southernmost is the chief. The stream was ascended in a cutter and two rowing-boats, and proved more easily navigable than is usually the case with Patagonian rivers. For the first 30 miles, during which it came from the south-east, it had the character of a forest stream with clear green water, and a breadth of from 150 to over 300 yards. Its valley is comparatively narrow, but the ground on both sides presents facilities for road-making. On the north a wooded plain extends for some distance. On December 2 Dr. Krüger reached a lake 15 miles long, formed by the river at an elevation of 200 feet. Its shores are so steep that it would be impossible to follow them by land. Beyond the lake the river was still navigable for a short space, the total distance traversed by boat being over 55 miles. Unlike many of the Patagonian rivers, it derives a comparatively small part of its volume from tributaries. In 43° 27′ S. a sudden change, both in the direction and character of the stream, takes place, as it there comes from the north-east and flows like a mountain torrent through a succession of narrows, progress through the forest on its banks being for a time excessively difficult. Subsequently the valley took an easterly direction, and it became possible to proceed in canvas boats, which were afterwards exchanged for wooden ones made by Dr. Krüger's men. The river was followed to the debouchure of the Corintos into the "Valley of the 16th October," and its identity with the Futaleufu was thus established. The journey has also disclosed a comparatively easy route from the sea to the colonies on the Futaleufu and its tributaries, while during further explorations in the district adjoining the upper Futaleufu, a good alternative route *viâ* the Renihue and Lake Barros Arana was shown to exist. After regaining the coast, Dr. Krüger was able to make some rectifications in the maps of the districts adjoining the mouth of the Yelcho.

POLAR REGIONS.

Peary's Arctic Expedition.—The Brooklyn *Standard Union* for July 15 contains a full account of the arrangements made by the Peary Arctic Club for the carrying of supplies to the explorer during the present summer, together with a hitherto unpublished narrative by Peary himself, of his voyage last summer from Sydney, C.B., to Etah in Foulke Fiord, on the eastern shore of Smith sound. The Peary Club expedition has been despatched in accordance with the explorer's instructions drawn up before his departure, and is under the leadership of Mr. Herbert L. Bridgman, a member of the Peary auxiliary expedition of 1894. The screw steamer *Diana*, Captain Samuel Bartlett master, has been secured for the voyage. The ship is regarded as one of the best of the St. John's sealing fleet, and was employed by the Canadian Government in 1897 for the examination of the entrances to Hudson bay. Her captain belongs to the well-known Bartlett family of Newfoundland, being brother of Captain John Bartlett of the *Windward*, and of Captain Harry Bartlett who commanded the *Falcon* in the 1893–94 Peary expeditions. Ample supplies of provisions have been despatched in the *Diana*, which sailed from St. John's on July 15, and after calling at Disco and Upernavik, will proceed to Bowdoin bay, in Inglefield gulf, where intelligence of the explorer and his party will probably be obtained. Failing this the ship will proceed to Littleton island, and, in accordance with Peary's instructions, supplies will be left at one or other of these places. The members of the present expedition do not expect to meet Peary in person, as, if all has gone well, the latter should be at some far northern point; it is thought, however, that letters will have been sent back by the Eskimo, who on their return north will also carry despatches to the explorer. It is hoped that news may also be obtained of Captain Sverdrup's party in the *Fram*, and in view of this letters and newspapers have been transmitted from Norway to be carried by the

Diana. Three independent parties have accompanied the expedition, one under Prof. William Libbey for deep-sea scientific work, and one headed by Robert Stein of Washington, to spend one or two winters in Ellesmere Land, in addition to a party of sportsmen. Mr. Peary's account of last year's voyage states that, helped by favouring winds, the *Hope* reached the latitude of Cape Farewell on July 12, five days after leaving Sydney. On the 15th * the edge of the East Greenland ice was sighted. This was last year unusually wide and heavy, but it was at last successfully passed. Progress was again rapid until Melville bay was reached, when the ice again formed a serious obstacle. The *Hope* was nipped on one occasion, but finally, after great difficulties, Cape York was reached, where, however, the settlement was found deserted, as was also that in Parker Snow bay. The first natives were met on Saunders island, 70 miles from Cape York, and from them it was learnt that the winter had been long and cold, and the spring catch of walrus had been a complete failure. Fortunately, however, an abundant supply of dogs was available. After the arrival of the *Windward*, the two ships cruised between Whale sound, Hakluyt island, and Littleton island, obtaining some walrus, and finally separating at Etah, in Foulke fiord, the *Hope* going south, and the *Windward* north. Some 80 tons of coal were landed from the *Hope* for the *Windward's* use on her return, while a depôt of provisions was to be made at Littleton island. Of the further experiences of the *Windward* nothing is yet known.

Mr. Wellman's Expedition.—According to a telegram from Tromsö, dated August 17, the steamship *Capella* arrived there that day with Mr. Walter Wellman and the survivors of his North Polar expedition. In the autumn of 1898, after reaching Franz Josef Land, it is stated, an outpost, called Fort McKinley, was established in lat. 81° (possibly in Wilczek Land), and a house was built of rocks roofed over with walrus hides. Here two men, Paul Bjoervig and Bernt Bentzen (who was with Nansen in the *Fram*), remained there during the winter. The main party wintered in a canvas-covered hut, named Harmsworth House, at Cape Tegetthoff, on Hall island, in lat. 80° N. In the middle of February, before the sun appeared, and in the depth of winter, Mr. Wellman, with three Norwegians and forty-five dogs, started north. On reaching Fort McKinley, they found that Bentzen had died two months before, but Bjoervig was well and cheerful. Pushing northwards through ice with severe storms and a temperature for ten days 40° to 50° below zero, it is stated that the party discovered new lands north of the Frenden (no doubt Frieden) islands (Nansen's Hvidtland). In the middle of March Mr. Wellman unfortunately fell into a crevasse and so severely injured his leg that the party had to retreat. Two days later, it is stated, an earthquake crushed many dogs and destroyed sledges. Had it not been for these misfortunes, it is stated, all hands were confident of reaching 87° or 88° N. Mr. Wellman had to be dragged in a sledge for 200 miles to headquarters, which were reached early in April. In subsequent sledge journeys, it is stated, the expedition explored unknown regions, and important scientific work was done by Dr. Hofmann, Lieut. Baldwin, and Mr. Hanlan. The *Capella* arrived at Cape Tegetthoff on July 27. On August 9 she met the Duke of Abruzzi's ship; all on board were well. No traces of Andrée were found in Franz Josef Land. It would seem from this summary that Mr. Wellman's journey was made up the last side of Franz Josef Land; but further details will be awaited with interest.

Drift-casks for the Determination of Arctic Currents.—The *Comptes*

* As the 15th is again mentioned later, this is possibly a misprint for 13th.

Rendus of the Paris Geographical Society (May, 1899) contains the announcement from San Francisco that the experiments with casks for the elucidation of the arctic currents, proposed by Commander Melville, are to be made under the auspices of the Philadelphia Geographical Society. The United States Government have agreed to co-operate, and fifty casks, specially constructed at San Francisco, will be set adrift in various parts of the Arctic ocean by the revenue cutter *Bear*, and by vessels of the Pacific Steam Whaling Co. and of the firm of Liebes and Co. Commander Melville's plan has already been described in the *Journal* (vol. xii. p. 194).

Russian Arctic Research.—The Russian Government has granted the sum of £6000 for the purchase of a ship for arctic exploration, for an expedition which is to be sent out for exploring the New Siberia islands and Sannikoff's Land under Baron Toll.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Eastern Margin of the North Atlantic Basin.—An instructive paper on this subject, by Mr. W. H. Hudleston, appears in the *Geological Magazine* for March and April of the present year. The feature to which especial attention is devoted by the writer is the "sub-oceanic continental slope," which constitutes the true eastern margin of the North Atlantic basin, and, running through 51° of latitude with a mean direction slightly west of the meridian of Greenwich, has a total length, including sinuosities, of no less than 5000 miles. This slope is described by the writer as performing a double function: in the first place, as the more or less abrupt termination of a continental mass, affording relief to the periodic strain, and becoming at times the seat of dynamic energies of great force; and in the second, containing all but the surface waters of the oceans within its limits. In presenting a general hydrographic description of the North Atlantic basin, Mr. Hudleston deals in turn with (1) the North Polar ocean and the Norwegian Atlantic; (2) the Icelandic shallows, due to volcanic extravasation, and forming a partial interruption of the great north-to-south depression; and (3) the British Atlantic and Bay of Biscay; the description in each case being followed by a consideration of the geological bearing of the facts. In laying stress on the linear arrangement of the North Atlantic oceanic depression, which since the voyage of the *Fram* is known to be continued northwards between Greenland and Spitsbergen into the North Polar basin, the writer touches on the great question of the permanence or non-permanence of the great features of the Earth's crust, showing the inconclusive nature of many of the arguments brought forward by supporters of the latter view, with whom the *onus probandi* may justly be considered to rest. Another point to which criticism is applied is the supposed existence of cañons and escarpments on the margin of the Bay of Biscay. The conclusions to be drawn from a study of the whole question are summed up at the end of the paper. The writer holds that the true eastern boundary of the North Atlantic basin is the submerged slope lying beyond the edge of the submerged platform; that the edge of the platform ranges from about 80 to 250 fathoms; that the sub-oceanic slope—the true limit between the continental and oceanic areas—may be traced more or less distinctly, though of unequal strength and interrupted by extensive basaltic eruptions, as far as the north-west of Spitsbergen, where the north-north-east trend becomes easterly in face of the North Polar ocean; and that local changes to the extent of 500 fathoms would still leave the great depths unaffected.

CORRESPONDENCE.

M. Dutreuil de Rhins in Central Asia.

Paris, 20 Boulevard des Invalides, Août 4, 1899.

MADAME RIJNHART, dont vous connaissez certainement le long et douloureux voyage dans le Tibet oriental, vient de m'écrire pour me faire part des renseignements qu'elle et son mari ont recueillis sur la triste affaire qui a amené la mort de Dutreuil de Rhins. Les témoignages de tous ceux que M. et Mme. Rijnhart ont interrogés concordent entièrement avec le récit que j'ai publié des événements en question. Personne ne connaissait rien, dit en propre termes ma correspondante, des faits racontés par le Dr. Hedin. Là dessus tout le monde est d'accord, le Chinois de Tong-kar, attaché comme interprète à l'expédition envoyée à Tong-bou-mdo par le vice-roi du Chen-kan, le lama mongol qui sert d'interprète au fonctionnaire chinois que le Légat Impérial de Si-ning délègue de temps à autre à Gyé-rgoun-do, enfin d'une manière générale tous les Tibétains des environs de Gyé-rgoun-do bien placés pour savoir le détail des faits à cause de leur voisinage des lieux où Dutreuil de Rhins a péri. Le premier homme cité ci-dessus, dont M. et Mme Rijnhart avaient pu apprécier auparavant le caractère honorable, a été rencontré par eux à Barong-Tsadam, le second a été vu par Mme. Rijnhart seule à Gyé-rgoun-do même. Je ferai remarquer que le missionnaire hollandais et sa femme sont les seuls Européens qui, depuis notre propre voyage, aient pénétré assez près de l'endroit où notre caravane a été attaquée, les seuls aussi qui aient pu causer avec les indigènes sans le secours d'un interprète. D'ailleurs les temoignages qu'ils ont recueillis ne font que confirmer le résultat déjà acquis par l'enquête officielle chinoise.

Comme le Journal de votre Société s'est fait autrefois l'écho de bruits dont l'inexactitude est ainsi définitivement démontrée, j'ose compter, Monsieur, sur votre haute courtoisie pour insérer cette rectification sous la forme que vous jugerez convenable. Je n'entends pas plus polémiquer aujourd'hui sur cette vieille question que je ne l'ai fait autrefois, j'entends seulement constater des faits indiscutablement acquis.

F. GRENARD.

Bear Island.

On p. 55 of the July number of the *Geographical Journal* you publish a map of Bear island, made by the Swedish Polar Expedition of 1898. I desire to call attention to important mistakes in nomenclature which should be corrected.

In Purchas's account of Poole and Bennet's expedition of 1605, it is stated that they gave to the hill at the south of the island (the one whose slopes were climbed to call for help) the name Mount Misery. "Likewise," continues Poole, "there is a very high mountain on the E.S.E. point of this island, which, because Master Welden and I (J. Poole) got two foxes neere it, I called it Mount Maleperdus, alluding to the name in the merrie booke of Reinold the Foxe."

The Mount Misery of the new map and Admiralty chart I take to be Mount Maleperdus, whilst Mount Hamberg is the true Mount Misery.

MARTIN CONWAY.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1898-1899.

May 8, 1899.—The paper read at this meeting (see vol. xiii. p. 673) was "Travels in the Bolivian Andes." By Sir Martin Conway.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.	Mag. = Magazine.
Abh. = Abhandlungen.	Mem. = Memoirs, Mémoires.
Ann. = Annals, Annales, Annalen.	Met. = Meteorological.
B. = Bulletin, Bollettino, Boletim.	P. = Proceedings.
Com. = Commerce.	R. = Royal.
C. Rd. = Comptes Rendus.	Rev. = Review, Revue.
Erdk. = Erdkunde.	S. = Society, Société, Selskab.
G. = Geography, Geographie, Geografia.	Sitzb. = Sitzungsbericht.
Ges. = Gesellschaft.	T. = Transactions.
I. = Institute, Institution.	V. = Verein.
Iz. = Izvestiya.	Verh. = Verhandlungen.
J. = Journal.	W. = Wissenschaft, and compounds.
k. u. k. = kaiserlich und königlich.	Z. = Zeitschrift.
M. = Mitteilungen.	Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps—Lakes. *Rev. G. Italiana* 6 (1899): 420–421. **Halbfass.**
Dati morfometrici di alcuni laghi prealpini. Pel Dottore Guglielmo Halbfass.

Austria—Bosnia. *Deutsche G. Blätter* 22 (1899): 71–85. **Bräss.**
Jajce, die alte Königsstadt Bosniens. Von Dr. Martin Bräss.

Austria—Poland. ———
Akademia Umiejętności w Krakowie. Sprawozdanie Komisyi Fizyograficznej. T. xxxiii. w Krakowie, 1898. Size 9½ × 6, pp. xviii. 200, 212, and 46. *Presented by the Cracow Academy of Sciences.*

Austrian Alps. ———
Siebenter Jahres-Bericht des Sonnblick-Vereines für das Jahr 1898. Wien, 1899. Size 12 × 8, pp. 60. *Illustrations.*

This report contains articles on some ancient customs of the Austrian mountain people, a list of minerals found on the Sonnblick, and the results of recent meteorological observations on the mountain.

Azores. *C.Rd.* 128 (1899): 1471-1473. **Thoulet.**
Carte bathymétrique de l'archipel des Açores. Note de M. J. Thoulet.

Describes the additions made by the Prince of Monaco to our knowledge of the bed of the ocean round the Azores.

Balkan Peninsula. *Petermanns M.* 45 (1899): 97-106. **Mach.**
Beiträge zur Ethnographie der Balkanhalbinsel. Von Richard v. Mach. *With Maps.*

Belgium. **Lancaster.**
Le climat de la Belgique en 1897. Par A. Lancaster. Bruxelles, 1898. Size 7 × 5, pp. 202. *Map and Diagrams. Presented by the Author.*

Belgium. *B.S.R. Belge G.* **23** (1899): 136-144. **Rahir.**
Le Vallon des Chaudières (Bassin de l'Amblève). Par Edmond Rahir. *With Illustrations.*

Belgium—Canals. *P.I. Civil Engineers* **136** (1899): 282-306. **Vernon-Harcourt.**
The Brussels International Congress on Navigation of 1898; the Bruges Ship-Canal; and New Works at Ostend and Antwerp. By L. F. Vernon-Harcourt. *With Plans and Sections.*

Denmark—Oceanographical Observations. ——
Beretning fra Kommissionen for videnskabelig Undersøgelse af de danske Farvande. Andet Bind. Første Hefte. Ditto Andet Hefte. Kjøbenhavn, 1897-1899. Size 13 × 10, and 14 × 10½, pp. 32 and 80. *Diagrams. Presented by the Author.*

Europe—Maps. **Haardt v. Hartenthurn.**
M. k. u. k. Militär-G. I. **18**, 1898 (1899): 112-159.
Die militärisch wichtigsten Kartenwerke der europäischen Staaten. Von Vincenz Haardt von Hartenthurn. *With Maps.*

An account of the most important large-scale Government maps of the different countries of Europe.

Europe—Meteorology. *Met. Z.* **16** (1899): 241-256. **Kassner.**
Ueber die Bewölkung in Europa an Cyklonen- und Anticyklonen-Tagen. Von Dr. C. Kassner.

On the distribution of cloud over Europe in cyclonic and anticyclonic weather.

France. *Mém. S. Spéléologie* **3** (1898): 1-16. **Janet.**
L'Embut de Caussols (Alpes-Maritimes). Par M. Armand Janet. *With Plans and Illustration.*

France. **Leroux.**
Le Massif Central. Histoire d'une région de la France. Par Alfred Leroux. 3 vols. Paris: É. Bouillon, 1898. Size 10 × 6½, pp. (vol. i.) xxviii. and 432; (vol. ii.) 388; (vol. iii.) 312. *Price 21s.*

This historical study is based throughout on geographical conditions, and it brings out the control always exerted by the physical conditions of the region on the inhabitants and their industries.

France. **Reclus.**
Le Plus Beau Royaume sous le Ciel, Décrit par Onésime Reclus. Paris: Hachette et Cie, 1899. Size 9½ × 7, pp. 862. *Price 9s.*

A picturesquely written description of the geography of France, full of accurate detail happily applied to the elucidation of geographical principles. Although without maps or illustrations, the volume is a model of typographical grace, and there is an ample index.

France—Brittany. *P. Canadian I.* **2** (1899): 11-14. **Macallum.**
The Prehistoric Monuments of Brittany. By Prof. A. B. Macallum.

France—Isère. *Spelunca* **4** (1898): 115-122. **Mellier.**
Projet d'utilisation de la grotte de Goule-Noire (Isère). Par M. Étienne Mellier.

The proposal outlined in this paper is to utilize caverns as underground reservoirs, and so store up and employ to the best advantage the rainfall of the district.

France—Jura. *Spelunca* **4** (1898): 109-115. **Fournier.**
Note préliminaire sur quelques explorations spéléologiques dans le Jura. Par M. E. Fournier.

France—Savoy. *Deutsche Rundschau G.* **21** (1899): 385-402. **Mader.**
Auf den Mounier. Von Dr. Fr. Mader. *With Illustrations.*

Germany—Gravity. **Haasemann.**
Veröffentlichung des Königl. Preussischen Geodätischen Institutes. Bestimmung der Intensität der Schwerkraft auf fünf und fünfzig Stationen von Hadersleben bis Koburg und in der Umgebung von Göttingen. Bearbeitet von L. Haasemann. Berlin: P. Stankiewicz. 1899. Size 10 × 7½, pp. 96. *Plates.*

Holland—Bibliography. **Thorne.**
Reading List on the Netherlands. By Elisabeth Gertrude Thorne.—University of the State of New York, State Library Bulletin. Bibliography No. 9. April, 1898. Albany, 1898. Size 10 × 7, pp. 185–207.

Iceland. **Thoroddsen.**
Explorations in Iceland during the years 1881–98. By Dr. Th. Thoroddsen. From the *Geographical Journal* for March and May, 1899. Size 10 × 6½, pp. 56. *Map and Illustrations.*

Italy—Apulia. *Riv. G. Italiana* **6** (1899): 81–93, 193–200, 271–283. **Bertacchi.**
Sulla Plastica e la Geologia della Regione Pugliese. Nota di Cosimo Bertacchi.

Italy—Sicily. *Riv. G. Italiana* **6** (1899): 284–290. **Marinelli.**
Spostamento della foce del Simeto (Sicilia). Nota di Olinto Marinelli. *With Sketch-map.*

On the changes in the position of the mouth of the river Simeto between 1867 and 1897.

Italy—Venice—Bibliography. **Sperry.**
Reading List on Venice. By Helen Sperry.—University of the State of New York. State Library Bulletin. Bibliography No. 7. February, 1898. Albany, 1898. Size 10 × 7, pp. 137–156.

Norway—Fisheries. *Rev. Scientifique* **11** (1899): 673–681. **Pérard.**
La pêche en Norvège. Par M. J. Pérard.

Russia. *Petermanns M.* **45** (1899): 129–146. **Immanuel.**
Der russische Norden und die Murman-Küste. Von Hauptmann Fr. Immanuel. *With Maps.*

Russia—Finland. *Blackwood's Mag.* **166** (1899): 1–15. ———
The Downfall of Finland: an Object-Lesson in Russian Aggression.

Russia—Finland. *Meddelanden G. Fören. Finland* **4** 1897–1898 (1899): 1–81. **Borg.**
Fysillis-maantieteellisiä tutkimuksia Kalvolan pitäjässä. Tehnyt Väinö Borg. *With Map and German Abstract.*

On the parish of Kalvola, in South-Western Finland, describing the orography, hydrography, vegetation, and population.

Russia—Finland. **Hammarström.**
Meddelanden G. Fören. Finland **4**, 1897–1898 (1899): 1–20.
Om Bötombergen. Af R. Hammarström. *With Sketch-map and German Abstract.*

On the Bötom mountains in the south of the province of Wasa.

Russia—Finland. **Hammarström.**
Meddelanden G. Fören. Finland **4**, 1897–1898 (1899): 1–32.
Ätsärinselkä och Välivesi sjöar. Af R. Hammarström. *With Map and German Abstract.*

On the survey of Lakes Ätsärinselkä and Välivesi, with bathymetrical map.

Russia—Finland. *Meddelanden G. Fören. Finland* **4**, 1897–1898 (1899): 1–34 **Häyrén.**
Granbeståanden i Finland. Af A. E. Häyrén. *With Map and German Abstract.*

On the pine forests and pine-swamps of Finland and the associated undergrowths.

Russia—Finland. *Meddelanden G. Fören. Finland* **4**, 1897–1898 (1899): 1–13. **Hult.**
Finlands landryggar. Af R. Hult. *With German Abstract.*

On the insufficiency of the conventional representation of heights on maps to show the character of the land-ridges, which are the most conspicuous features of the configuration of Finland, and the advantage of using methods which will not give the appearance of a mountain range to every watershed.

Russia—Finland. *Meddelanden G. Fören. Finland* **4**, 1897–1898 (1899): 13–14. **Hult.**
Die Pflanzenregionen des finnländischen Lappmarken. Von R. Hult.

The original text in Swedish under the title, "Växtregionerna i Finlands lappmarker," was published in the previous number of the *Föreningen*, 1897, pp. 60–71.

Russia—Finland. *Meddelanden G. Fören. Finland* **4**, 1897–1898 (1899): 1–22. **Hult.**
Nyländska dalar. Af R. Hult. *With Map and German Abstract.*

On the valleys of Nyland, in Southern Finland.

Russia—Finland. *Meddelanden G. Fören. Finland* 4, 1897–1898 (1899): 1–3. **Rosberg.**
Dynerna på Tauvonsaari. Af J. E. Rosberg. *With Map.*

On the sand-dunes of the Tauvonsaari peninsula.

Russia—Finland. *Meddelanden G. Fören. Finland* 4, 1897–1898 (1899): 1–14. **Streng.**
Djupkarta öfver Lojo sjö. Västra hälften. Af A. E. Streng. *With Map and German Abstract.*

Bathymetrical map of the Lojo lake.

Russia—Finland. *Meddelanden G. Fören. Finland* 4, 1897–1898 (1899): 1–29. **Thesleff.**
Zigenarnes utbredning i Finland. Af Arthur Thesleff. *With Map and German Abstract.*

On the distribution of gypsies in Finland.

Russia—Military Cartography. **Truck.**
M. k. u. k. Militär-G. I. 18, 1898 (1899): 169–224.
Die Entwicklung der russischen Militär-Kartographie vom Ende des 18. Jahrhunderts bis zur Gegenwart. Nach officiellen Quellen bearbeitet von Sigismund Truck.

Sweden. ———
Svenska Turistföreningens Årsskrift för År 1899. Stockholm: Wahlström & Widstrand. Size 8½ × 5½, pp. viii. and 444. *Illustrations. Presented by the Svenska Turistföreningen.*

Turkey. *M. k. u. k. Militär-G. I.* 18, 1898 (1899): 97–111. **Steeb.**
Der Ljubeten in der Sara Planina. Von Christian Ritter v. Steeb. *With Sketch-maps.*

On the survey of the mountain group of the Ljubeten.

United Kingdom—England. *Fortnightly Rev.* 66 (1899): 53–62. **Jacobs.**
The Mean Englishman. By Joseph Jacobs.

This is a demographic study intended to illustrate the character of the English people by that of an individual fulfilling the average conditions of the Englishman in every particular.

United Kingdom—England. *Quarterly J. Geolog. S.* 55 (1899): 129–169. **Groom.**
The Geological Structure of the Southern Malverns, and of the Adjacent District to the West. By Prof. T. T. Groom. *With Plates and Sections.*

United Kingdom—England—Education. **Hodgins.**
Report on Popular Education in England, 1897–98. By J. George Hodgins, M.A., LL.D. Being Appendix N of the Report of the Minister of Education for the Province of Ontario for the year 1897–98. Toronto, 1899. Size 10 × 6½, pp. 78.

United Kingdom—England. **Murray.**
A Handbook for Travellers in Somerset. Fifth Edition. London: John Murray, 1899. Size 7 × 4½, pp. xxxvi. and 536. *Maps and Plans. Price 6s. Presented by the Publisher.*

The county of Somerset has now been placed in a volume by itself. The descriptions have been brought up to date, due provision being made for the wants of cyclists, and the book is admirably supplied with clear large-scale maps.

United Kingdom—England. **Ward.**
Thorough Guide Series. The Eastern Counties, with a practical Section on the Rivers and Broads. By C. S. Ward, M.A. Twenty-one Maps and Plans, by J. Bartholomew. Fourth Edition—Revised. London: Dulau & Co., 1899. Size 6½ × 4½, pp. x. and 144. *Price 3s. 6d. Presented by the Publishers.*

United Kingdom—Erratic Blocks. *Brit. Assoc. Rep.* (1898): 552–556. ———
Erratic Blocks of the British Isles. Report of the Committee.

United Kingdom—Ethnographical Survey. *Brit. Assoc. Rep.* (1899): 712–714. ———
Ethnographical Survey of the United Kingdom.—Sixth Report of the Committee.

United Kingdom—Geology. *Brit. Assoc. Rep.* (1898): 530–546. ———
Photographs of Geological Interest in the United Kingdom.—Ninth Report of the Committee.

The collection of photographs of geological interest amounted at the date of this report to 2001.

United Kingdom—Ireland. *P. R. Irish A.* 5 (1899): 223-268. **Browne.**
The Ethnography of Garumna and Lettermullen, in the County Galway. By Charles R. Browne, M.D. *With Plates.*

United Kingdom—Ireland. *T.R. Irish A.* 31 (1899): 209-344. **Macalister.**
On an Ancient Settlement in the South-West of the Barony of Corkaguiney, County of Kerry. By R. A. Stewart Macalister. *With Map and Plates.*

A detailed description of a series of ancient buildings, hitherto very imperfectly described, with observations on their probable nature and origin.

United Kingdom—Ireland. *P.R. Irish A.* 5 (1899): 294-311. **Westropp.**
A List of the Round Towers of Ireland, with Notes on those which have been Demolished, and on four in the County of Mayo. By Thomas J. Westropp, M.A.

United Kingdom—Meteorology. ——
Report of the Meteorological Council for the year ending March 31, 1898, to the President and Council of the Royal Society. London: Eyre & Spottiswoode, 1898. Size 10 × 6½, pp. 140. *Map and Plans.* *Price* 11*d.* *Presented by the Meteorological Office.*

United Kingdom—Mines and Quarries. ——
Mines and Quarries: General Report and Statistics for 1898. Part i.—District Statistics. Statistics of the Persons employed, output, and accidents at Mines and Quarries in the United Kingdom, arranged according to the Inspection Districts. London: Eyre and Spottiswoode, 1899. Size 13 × 8½, pp. 46. *Maps.* *Price* 8*d.* *Presented by the Home Office.*

The total number of people employed in mines in 1898 was 741,125, and in quarries 134,478. The output of coal for the year was 202,054,516 tons, and that of iron-ore 14,176,938 tons. Fatal accidents in mines caused 941 deaths, and in quarries 134. The output of coal showed an increase in all districts except South Wales and South-Western England, where the decrease was so great as to give a net decrease for the year of 75,000 tons.

United Kingdom—Scenery. **Marr.**
The Development of British Scenery. By John E. Marr, F.R.S. [Reprinted from *Science Progress*, vol. vii. (vol. ii. of New Series), No. 8, July, 1898.] London: The Scientific Press, 1898. Size 10 × 6½, pp. 12. *Presented by the Author.*

On the scientific study of the forms of the land.

United Kingdom—Scotland. **Morris.**
The Geography of the Forth Valley. By David B. Morris. Read to the Stirling Natural History and Archæological Society, January 17, 1899. (Reprinted from the *Stirling Journal and Advertiser.*) 1899. Size 7 × 5, pp. 18. *Presented by the Author.*

An endeavour to give a geographical account of the valley of the Forth, taking account of all departments of the science.

Western Europe—Sub-Oceanic Terraces. **Hull.**
On the Sub-Oceanic Terraces and River Valleys off the Coast of Western Europe. By Prof. Edward Hull, LL.D., etc. Being a paper read before the Victoria Institute, April 17, 1899. London: Victoria Institute, 1899. Size 8½ × 5½, pp. 22. *Charts and Sections.* *Presented by the Author.*

ASIA.

Arabia. **Landberg.**
Arabica. Par le Comte de Landberg. No. V. Leide: E. J. Brill, 1898. Size 9½ × 6½, pp. xii. and 320. *Presented by the Author.*

Describes the following regions of Southern Arabia, Beyhan el-Qasab, Beyhan el-Asfal, Harib, the Wahidi country, Gerdan, and Sabwa.

Arabia. **Müller.**
Die Südarabische Expedition der Kaiserlichen Akademie der Wissenschaften in Wien und die Demission des Grafen Carlo Landberg. Actenmässig dargestellt von Dr. D. H. Müller. Wien und Leipzig: W. Braumüller, 1899. Size 10 × 6½, pp. 62. *Presented by the Publisher.*

This is Dr. Müller's reply to Count Landberg's account of the recent Austro-Hungarian Arabian expedition, and presents his view of the case.

Arabia—Mecca. *T.R.S. Literature* **20** (1899): 197–235. **Burton.**
Burton's Pilgrimage to Mecca: an Unpublished MS. of the late Sir Richard F. Burton, F.R.S.L. With an Introduction by W. H. Wilkins, M.A.

Central Asia. *G. Tidskrift* **15** (1899): 14–22. **Olufsen.**
Den anden danske Pamir expeditions Vinterstation 1898–99. Ved Premier-løjtnant Olufsen. *With a Sketch-map.*

Central Asia. **Trotter.**
The Proceedings of the Pamir Boundary Commission. By Lieut.-Colonel Henry Trotter. From the *Geographical Journal* for April, 1899. Size 10 × 6½, pp. 8.

China. *Blackwood's Mag.* **165** (1899): 1069–1077. ———
Wei-hai-wei: Its Value as a Naval Station.

China. **Beresford.**
The Break-Up of China, with an Account of its Present Commerce, Currency, Waterways, Armies, Railways, Politics, and Future Prospects. By Lord Charles Beresford. London and New York: Harper & Bros., 1899. Size 9 × 6, pp. xviii. and 510. *Maps. Price* 12*s.*

Lord Charles Beresford was in China from September 30, 1898, to January 9, 1899. He visited all the British mercantile communities in China, and interrogated the merchants and others as to the condition of the country. He also inspected the Chinese army, navy, and the forts and arsenals. The journey was carried out for the Associated Chambers of Commerce in London.

China. **Chevalier.**
Observatoire de Zi-ka-wei. La Navigation à Vapeur sur le Haut Yang-tse. Par le R. P. S. Chevalier, S.J. Chang-hai: Kelly & Walsh, 1899. Size 13 × 10, pp. 14. *Maps. Presented by the Observatory of Zi-ka-wei.*

China. **Gorst.**
China. By Harold E. Gorst. London: Sands & Co., 1899. Size 9 × 6, pp. xx. and 300. *Map and Illustrations. Price* 6*s.*

On the economic resources of China, and the present political and commercial conditions of the country.

China. *Fortnightly Rev.* **66** (1899): 37–52. **Gundry.**
China: Spheres of Interest, and the Open Door. By R. S. Gundry.

China. *S.G., Tōkyō G.S.* 10 (1898): 583–592, 637–641. **Kinosuke.**
A Travel along the Minkiang, Fukien Province, China. By Kinosuke, Mouye. [In Japanese.]

China. **Little.**
Intimate China. The Chinese as I have seen them. By Mrs. Archibald Little. London: Hutchinson & Co., 1899. Size 10 × 7, pp. xvi. and 616. *Map and Illustrations. Price* 21*s.*

This book gives an epitome of the author's experience in China, especially with reference to the domestic life and customs of the Chinese.

China—Formosa. *Z. Ges. Erdk. Berlin* **34** (1899): 63–74. **Kakyo.**
Die wilden Stämme von Formosa, ihre Einteilung und ihr Kulturzustand. Von Ino Kakyo. Uebersetzung eines in japanischer Sprache geschriebenen Berichtes. *With Map.*

Chinese Geography. **Schlegel.**
Geographical Notes. VI. Ma-it—Ma-it-tung—Ma-iëp-ung. By G. Schlegel (pp. 22). VII. Tun-sun or Tian-sun, Tĕnasserim or Tānah-sāri. VIII. Pa-hoang, Pang-k'ang, Pang-hang, Pahang or Panggang. IX. Dziu Hut, Djohor (Johore). By G. Schlegel (pp. 22). X. To-ho-lo or Tok-ho-lo, Takōla or Takkōla. XI. Halotan or Kilantan, Kalatan or Kĕlantan. By G. Schlegel (pp. 12). Leyden: E. J. Brill, 1899. Size 10 × 6½. *Presented by the Author.*

India. *J.S. Arts* **47** (1899): 575–590. **O'Dwyer.**
Agrarian Conditions under British and Native Rule: a comparison of the Revenue Systems of British-India and Rajputana. By Michael Francis O'Dwyer.

India—Calcutta. *J.S. Arts* **47** (1899): 628–652. **Stevens.**
The Port of Calcutta. By Sir Charles Cecil Stevens, K.C.S.I.

India—Historical. *Indian Antiquary* 28 (1899): 1–6. **Abbott.**
The Topographical List of the Bhagavata Purana. By Rev. J. E. Abbott, B.A.

India—Survey Report. **Strahan.**
General Report on the Operations of the Survey of India Department administered under the Government of India during 1897–98. Prepared under the direction of Major-General C. Strahan. Calcutta, 1899. Size 13½ × 8½, pp. vi., 98, and lx. *Maps and Plates. Presented by the Surveyor-General of India.*

Japan—Bibliography. **Gay.**
Reading List on Japan. By Helen Kilduff Gay. University of the State of New York. State Library Bulletin, Bibliography No. 6, February, 1898. Albany, 1898. Size 10 × 7, pp. 121–135.

Japan—Proverbs. **Ehmann.**
Die Sprichwörter und bildlichen Ausdrücke der Japanischen Sprache. Gesammelt, Uebersetzt und Erklärt von P. Ehmann. Theil V. (von *Tanshi* bis *Zukan*), nebst Nachtrag. Supplement der "Mittheilungen" der Deutschen Gesellschaft für Natur- und Völkerkunde Ostasiens. Tokyo, 1898. Size 9 × 6, pp. 321–428.

Malay Archipelago—Sumatra. *Globus* 75 (1899): 318–325. **Volz.**
Hausbau und Dorfanlage bei den Battakern in Nordsumatra. Von Privatdocent Dr. Wilhelm Volz. *With Illustrations.*

Persia. **Reclus.**
La Perse. Par Élisée Reclus. Extrait du 'Bulletin de la Société neuchâteloise de Géographie,' tome xi., 1899. Neuchatel, 1899. Size 9 × 6½, pp. 40. *Maps. Presented by the Author.*

Philippine Islands. *Sitzb. A. W. Berlin* (1899): 14–26. **Virchow.**
Die Bevölkerung der Philippinen. Von Rud. Virchow. Zweite Mittheilung. *With Illustrations.*

Philippine Islands—Cyclones. **Algué.**
Observatorio de Manila. Baguios ó Ciclones Filipinos. Estudio teórico—práctico por el P. José Algué S. J. Manila, 1897. Size 10½ × 7½, pp. xii. and 308. *Diagrams. Presented by the Manila Observatory.*

On the paths pursued by the cyclones or typhoons passing over the Philippine Islands, with instructions for forecasting storms.

Portuguese India. *B.S.G. Lisboa* 16 (1897): 569–618. **Fernandes.**
Memoria historico-economica das alfandegas do estado da India portugueza. Por Francisco Xavier Ernesto Fernandes.

Russia—Caucasia. *Rev. G.* 44 (1899): 241–275, 340–358. **Baye.**
Au sud de la chaîne du Caucase. Souvenirs d'une mission. Par Baron de Baye. *With Illustrations.*

Russia—Caucasus. *Scottish G. Mag.* 15 (1899): 281–308. **Dingelstedt.**
The Hydrography of the Caucasus. By Victor Dingelstedt. *With Maps and Illustrations.*

The map shows the distribution of forests, grassy steppes with cultivated land, steppes, swamps, and mountain flora for the whole province of the Caucasus.

Russia—Caucasus. **Stevens.**
Trade of Batoum and District for the year 1898. Foreign Office, Annual No. 2254, 1899. Size 10 × 6½, pp. 28. *Price 2d.*

Russia—Siberia. *Travel* 4 (1899): 26–29. **Barrett-Hamilton.**
Glimpses of Life in the Far North-East. An Account of a Visit to Ukinsk Bay, North-Eastern Kamchatka. From Notes read at the Meeting of the British Association in September, 1898. By G. E. H. Barrett-Hamilton. *With Illustrations.*

Russia—Siberia. *G.Z.* 5 (1899): 326–346. **Immanuel.**
Die Gebirge Nordsibiriens. Von Hauptmann Immanuel. *With Map.*

Russia—Siberia. **Studnicki.**
Die Wahrheit über Sibirien. Studien nach der Natur, von Ladislaus Studnicki. Berlin: J. Räde, 1899. Size 8 × 5½, pp. x. and 162. *Price 3s.*

The author was born in Siberia, and spent the greater part of his life there. He treats of the position, climate, agriculture, land-tenure, economic development, crime, and colonization.

Russian Central Asia. *G.Z.* 5 (1899): 241-251. **Boehm.**
Reiseskizzen aus Transkaspien. Von Georg Boehm.

Russian Central Asia. **Skrine and Ross.**
The Heart of Asia. A History of Russian Turkestan and the Central Asian Khanates from the Earliest Times. By Francis Henry Skrine and Edward Denison Ross, PH.D London: Methuen & Co., 1899. Size 8½ × 6, pp. xii. and 444. *Maps and Illustrations. Price 10s. 6d. Presented by the Publishers.*

The first half of this important work is a concise history of Central Asia from the earliest times to the Russian occupation. The second half deals with the recent progress of the Russian advance, and there are two short appendices on Russian policy in Central Asia.

Turkey—Syria. *Globus* 75 (1899): 339-340. ——
Gebel Sēs in der Harra und seine Ruinen. *With Map and Illustration.*

AFRICA.

Africa. *Imp. and Asiatic Quarterly Rev.* 7 (1899): 129-134. **Seton.**
Britain in Africa—a Forecast. By Malcolm Seton.

Africa—Travel. *Rev. Française* 24 (1899): 321-327. **Demanche.**
Le Retour de Marchand: Chronologie de l'expédition. Par G. Demanche.

Algeria. *Scottish G. Mag.* 15 (1899): 361-365. ——
The Western Erg of Algeria.

Algeria. *Ann. G.* 8 (1899): 366-369. **Besnier.**
Notes sur l'Aurès: la plaine d'Arris. Par M. M. Besnier. *With Plates.*

Algeria—Sahara. *Rev. Française* 24 (1899): 328-331. **Foureau and Lamy.**
Sahara: La marche de la mission Foureau-Lamy. III. *With Map and Profile.*

Algeria—Sahara. *Questions Dipl. et Colon.* 7 (1899): 129-145. **Kryszanowski.**
La Pénétration du Sahara par l'Algérie, et la Mission Foureau-Lamy. Par L. Kryszanowski. *With Map.*

Congo State. *B.S.R.G. d'Anvers* 23 (1899): 39-76. **Van den Plas.**
Le Mayumbe. Par M. J. Van den Plas.

Congo State. *Mouvement G.* 16 (1899): 226-227. **[Wauters.]**
Carte de la haute Sanga et du territoire concédé à la Compagnie Sud-Kamerun. *With Map.*

Egypt. *Fortnightly Rev.* 65 (1899): 931-942. **Whittle.**
Egypt after Omdurman. By J. Lowry Whittle.

Egypt—Historical. *Abh. A.W. Berlin* (1898): 1-20. **Virchow.**
Ueber die ethnologische Stellung der præ-historischen und protohistorischen Aegypter. Von R. Virchow. *With Plates.*

Egypt—Nile Valley. *Ann. G.* 8 (1899): 242-251. **Brunhes.**
Les grands travaux en cours d'exécution dans la vallée du Nil. Par M. J. Brunhes. *With Map and Plates.*

Egypt—Suez Canal. ——
Commercial. No. 4 (1899). Suez Canal. Returns of Shipping and Tonnage, 1896, 1897, and 1898. London: Eyre and Spottiswoode, 1899. Size 13½ × 8½, pp. 10. *Price* 1½*d.*

In 1899 the number of vessels passing through the Suez canal was 3503, of which 2295 carried the British flag. British ships amounted to 65·2 per cent. in number, and their tonnage was 68·2 per cent. of all that passing through the canal.

Egyptian Sudan. *Scottish G. Mag.* 15 (1899): 80-86, 138-142, 309-316. **Capenny.**
The Khedivic Possessions in the Basin of the Upper Ubangi. By S. H. F. Capenny.

Egyptian Sudan. **Garstin.**
Egypt. No. 5 (1899). Despatches from Her Majesty's Agent and Consul-General at Cairo, inclosing a Report on the Soudan, by Sir William Garstin, K.C.M.G. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. 28. *Price 3d.*

French Africa. *Rev. Française* **24** (1899): 296–299. ——

La Convention Franco-Anglaise du 21 Mars 1899. *With Map.*

The map shows very clearly the extent and limits of French territory in Africa.

French Congo. ——

Renseignements Colon., Comité l'Afrique Française **5** (1899): 73–88.

L'organisation du Congo français: décrets sur le régime foncier, les concessions et le régime forestier de la colonie.

French Sahara. *Questions Dipl. et Colon.* **7** (1899): 10–19. **Bernard.**

La Question du Transsaharien. Par Prof. Augustin Bernard.

A copy of the same paper, separately printed, has been presented by the Author.

French West Africa. *A travers le Monde, Tour du Monde* **5** (1899): 177–180. ——

Impressions du Fouta-Djalon. *With Illustrations.*

French West Africa. *Ann. G.* **8** (1899): 252–264. **Zimmermann.**

Résultats des missions Blondiaux et Eyssétic dans le Nord-Ouest de la Côte d'Ivoire. Par M. Maurice Zimmermann. *With Map and Plates.*

German South-West Africa. **Schwabe.**

Mit Schwert und Pflug in Deutsch-Südwestafrika. Vier Kriegs- und Wanderjahre. Von Kurd Schwabe. Berlin: E. T. Mittler und Sohn, 1899. Size 10½ × 7, pp. x. and 448. *Map and Illustrations. Price* 9*s.*

The four years' experience of a German officer in German South-West Africa.

German South-West Africa. **Sclater.**

Note on portions of the Cross or Memorial Pillar erected by Bartholomew Diaz near Angra Pequena in German South-West Africa. By W. L. Sclater. From *Transactions of the South African Philosophical Society*, 1898. Size 9½ × 6½, pp. 295–302. *Presented by the Author.*

German West Africa. *Globus* **75** (1899): 377–382. **Hutter.**

Die Völkerstämme an der Südgrenze Adamauas (Nordkamerun) Von Hauptmann Hutter. *With Map and Illustrations.*

German West Africa. *Deutsche Kolonialzeitung* **16** (1899): 69–72. **Passarge.**

Die Besitzergreifung des Hinterlandes von Kamerun. Von Dr. Siegfried Passarge. *With Map.*

German West Africa—Togo. *Globus* **75** (1899): 329–332. **Seidel.**

Togo im Jahre 1897–98. Von H. Seidel.

Madagascar. *Rev. Française* **24** (1899): 281–286. ——

Madagascar: La Région de Majunga.

Madagascar. *Tour du Monde* **5** (1899): 241–264. **Duruy.**

Mission dans le Nord-Ouest de Madagascar. Par M. le Lieutenant Victor Duruy. *With Map and Illustrations.*

Madagascar—People. *Rev. Scientifique* **11** (1899): 681–686. **Zaborowski.**

Les Hovas et le peuplement de Madagascar. Par M. Zaborowski.

Morocco. *Quarterly J. Geolog. S.* **55** (1899): 190–213. **Thomson.**

The Geology of Southern Morocco and the Atlas Mountains. By the late Joseph Thomson. *With Sections.*

This paper, although written by the late Joseph Thomson shortly after his return, was only read to the Geological Society in January, 1899.

Natal. *T.South African Philosoph. S.* **10** (1898): 419–426. **Churchill.**

Notes on the Geology of the Drakensbergen, Natal. By Frank F. Churchill. *With Plates.*

Niger. *Mouvement G.* **16** (1899): 163–165, 169–171, 182–185, 201–203. ——

Le bassin du Niger.

Portuguese Africa. *B.S.R.G. d'Anvers* **23** (1899): 12–36. **Vaes.**

Afrique lusitanienne. Souvenirs d'escales. Par M. G. Vaes.

South Africa. ——

The Delagoa Directory for 1899. A Year-book of Local Information regarding the Town and Port of Lourenço Marques, together with a Chapter on the Kaap

Gold-fields. Lourenço Marques and Barberton: A. W. Bayly & Co., 1899. Size 8½ × 5½, pp. 118. *Price 2s. 6d. Presented by the Publishers.*

This directory contains a great deal of detailed information regarding Lourenço Marques, the Delagoa Bay railway, and Barberton, which it would be difficult to find elsewhere.

South Africa—Bibliography. **Hollway.**

Bibliography of Books, Pamphlets, Maps, Magazine Articles, etc., relating to South Africa, with special reference to Geography. From the time of Vasco da Gama to the formation of the British South Africa Company in 1888. By H. C. Schunke Hollway. *Transactions of the South African Philosophical Society*, vol. x. part 2, 1898. Cape Town, 1898. Size 9½ × 6½, pp. 129–294. *Presented by the Author.*

South African Republic. ——

South African Republic. Papers relating to the Complaints of British Subjects in the South African Republic. London: Eyre and Spottiswoode, 1899. Size 13½ × 8½, pp. xii. and 244. *Price 2s.*

Southern Rhodesia. ——

British South Africa Co. Papers relating to the British South Africa Co. I. Southern Rhodesia, Order in Council, dated 20th October, 1898. II. Proclamation, dated 25th November, 1898, promulgating Native Regulations for Southern Rhodesia. III. Proclamation, dated 25th November, 1898, making provision for an Electoral System in Southern Rhodesia. IV. Draft of a Supplemental Charter of the British South Africa Company. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. 26. *Price 3d.*

Southern Rhodesia. **Dawkins.**

Précis of Information concerning Southern Rhodesia. Compiled in the Intelligence Division, War Office, by Major C. T. Dawkins, C.M.G. January, 1899. Size 10 × 6, pp. 56. *Map. Presented by the War Office.*

A terse and carefully compiled general description of Rhodesia south of the Zambezi.

Sudan—Anglo-French Convention. *C. Rd. S. G. Paris* (1899): 167–168. ——

La convention franco-anglaise du 21 mars 1899. *With Sketch-map.*

Tunisia—Anthropology. **Giglioli.**

La Trebbiatrice guernita di pietre in uso presso alcune tribù berbere nella Tunisia. Nota del Prof. Enrico H. Giglioli. (Estratto dall' *Archivio per l'Antropologia e l'Etnologia*, vol. xxvi. fasc. 1, 1896.) Size 10 × 6½, pp. 4. *Presented by the Author.*

Uganda Railway. **Molesworth.**

Africa, No. 5 (1899). Report on the Uganda Railway. By Sir Guilford Molesworth, K.C.I.E., dated March 28, 1899. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. x. and 36. *Maps and Sections. Price 1s. 2d.*

NORTH AMERICA.

America—Discovery. **Shipley.**

Some more discoverers of their predecessors' discoveries! An exposé of the plot. By Marie A. Shipley. Size 9 × 6, pp. 8. *Presented by the Author.*

Refers to some documents bearing on the early voyages of the Northmen to America.

Canada. ——

Tide Tables for Charlottetown, Pictou, and St. Paul Island, C.B., for 1899. With Tidal Differences for Northumberland Strait; and for the open Gulf shore, from Miramichi along the North Coast of Prince Edward Island. Ottawa, 1899. Size 10 × 6½, pp. 10.

Canada. *Deutsche G. Blätter* **22** (1899): 86–124. **Nederkorn.**

Die Entdeckungs-, Besiedelungs- und Entwicklungsgeschichte Canadas und seiner Grenzgebiete. Von Dr. W. Nederkorn.

Canada. *B. Nat. Hist. S. New Brunswick* **4** (1899): 93–104. **Trueman.**

The Marsh and Lake Region at the Head of Chignecto Bay. By George J. Trueman, M.A. *With Map.*

Canada—New Brunswick. *B. Nat. Hist. S. New Brunswick* **4** (1899): 105–107. **Duff.**

The "Dip" of the Magnetic Needle in New Brunswick. By Prof. A. Wilmer Duff.

Canada—North-Western Tribes. *Brit. Assoc. Rep.* (1898): 628–688. ———

The North-Western Tribes of Canada.—Twelfth and Final Report of the Committee.

Canada—Rocky Mountains. *J. Geology* 7 (1899): 247–260. **Wilcox.**

A certain type of Lake Formation in the Canadian Rocky Mountains. By Walter D. Wilcox. *With Maps and Illustrations.*

Canada—Yukon District. **Boillot.**

Tour du Monde 5 (1899): 145, 157, 169, 181, 193, 205, 217, 229.

Aux Mines d'Or du Klondyke. Par M. Léon Boillot. *With Maps and Illustrations.*

A well-written and finely illustrated description of the journey to the Klondike gold-fields and the life there.

Great Lakes. **Gilbert.**

Recent earth-movement in the Great Lakes region. By G. K. Gilbert.—Eighteenth Annual Report of the U.S. Geological Survey, Part ii. pp. 595–647. *Maps.* [Annual Reports of the Department of the Interior, 1897.] Washington, 1897.

North America—Bibliography of Travel. **Plympton.**

Select Bibliography on Travel in North America. Compiled by Charles William Plympton, University of the State of New York, State Library Bulletin, Bibliography No. 3, May, 1897. Albany, 1897. Size 10 × 7, pp. 37–60.

United States. ———

Annual Reports of the Department of the Interior, 1897 [11 vols.]:—Report of the Secretary of the Interior; Report of the Commissioner of the General Land Office (1897, pp. cxlviii. and 484); Report of the Commissioner of Indian Affairs (1897, pp. viii. and 1068, *Map*); Miscellaneous Reports (1897, pp. 848, *Maps and Illustrations*); Report of the Commissioner of Education, 2 vols. (1898, pp. lxxx. and 2390, *Illustrations*). Size 9 × 6. Eighteenth Annual Report of the United States Geological Survey, 5 vols. [in 6] (1897, *Maps and Illustrations*). Size 11½ × 8. Washington. *Presented by the U.S. Department of the Interior.*

United States. *Science* 9 (1899): 729–732. **Pritchett.**

A Magnetic Survey of the United States by the Coast and Geodetic Survey. By Dr. Henry S. Pritchett.

United States—Absaroka Range. **Hague.**

Early Tertiary Volcanoes of the Absaroka range. By Arnold Hague. [Presidential Address delivered before the Geological Society of Washington, February 22, 1899.] Washington, 1899. Size 10 × 6½, pp. 3–25. *Plates. Presented by the Author.*

United States—Agriculture. ———

Yearbook of the United States Department of Agriculture, 1898. Washington, 1899. Size 9½ × 6, pp. 768. *Maps and Illustrations. Presented by the U.S. Department of Agriculture.*

United States—Alaska. **Becker.**

Reconnaissance of the goldfields of Southern Alaska, with some notes on general geology. By George F. Becker.—Eighteenth Annual Report of the U.S. Geological Survey, Part iii. pp. 1–86. *Maps and Plates.* [Annual Reports of the Department of the Interior, 1897.] Washington, 1897.

United States—Alaska. **Spurr and Goodrich.**

Geology of the Yukon gold district, Alaska, by J. E. Spurr; with an introductory chapter on the history and present condition of the district, by H. B. Goodrich.—Eighteenth Annual Report of the U.S. Geological Survey, part iii. pp. 87–392. *Maps and Plates.* [Annual Reports of the Department of the Interior, 1897.] Washington, 1897.

United States—California. **Smith.**

A Geological Sketch of San Clemente Island. By William Sidney Tangier Smith.—Eighteenth Annual Report of the U.S. Geological Survey, part ii. pp. 459–496. *Map and Plates.* [Annual Reports of the Department of the Interior, 1897.] Washington, 1897.

United States—Geological Survey. ———

Eighteenth Annual Report of the United States Geological Survey to the Secretary of the Interior, 1896–97. Part ii. Papers chiefly of a Theoretic Nature (1898, pp. 654); Part v. (in 2 vols.) Mineral Resources of the United States, 1896 (1897, pp. xii. and 1400). Size 12 × 8. Washington. *Maps and Plates. Presented by the U.S. Geological Survey.*

United States—Historical. **Adams.**

Jared Sparks and Alexis de Tocqueville. By Herbert B. Adams. John Hopkin's University Studies in Historical and Political Science. Series xvi. No. 12. Baltimore: The Johns Hopkins Press, 1898. Size 9½ × 6½, pp. 62.

A considerable portion of this pamphlet is devoted to letters on the constitution and government of towns about 1832.

United States—Idaho **Lindgren and Knowlton.**

The Mining Districts of the Idaho basin and the Boise Ridge, Idaho, by W. Lindgren; with a Report on the Fossil Plants of the Payette Formation, by F. H. Knowlton.—Eighteenth Annual Report of the U.S. Geological Survey, Part iii. pp. 617–736. *Maps and Plates.* [Annual Reports of the Department of the Interior, 1897.] Washington, 1897.

United States—Indiana and Ohio. **Leverett.**

The Water Resources of Indiana and Ohio. By Frank Leverett.—Eighteenth Annual Report of the U.S. Geological Survey, Part iv. pp. 419–559. *Maps and Sections.* [Annual Reports of the Department of the Interior, 1897.] Washington, 1897.

Deals with rivers, lakes, and underground waters. The illustrations include topographical and geological maps and sections.

United States—Irrigation. **Schuyler.**

Reservoirs for irrigation. By James D. Schuyler.—Eighteenth Annual Report of the U.S. Geological Survey, Part iv. pp. 625–740. *Maps and Illustrations.* [Annual Reports of the Department of the Interior, 1897.] Washington, 1897.

United States—Massachusetts. **Shaler.**

Geology of the Cape Cod district. By N. S. Shaler.—Eighteenth Annual Report of the U.S. Geological Survey, Part ii. pp. 497–593. *Map and Plates.* [Annual Reports of the Department of the Interior, 1897.] Washington, 1897.

United States—Mineral Resources. ——

Mineral Resources of the United States, 1896.—Eighteenth Annual Report of the U.S. Geological Survey, Part. iv. [in 2 vols.] pp. xii. and 1400. *Map.* [Annual Reports of the Department of the Interior, 1897.] Washington, 1897.

Discusses the industries connected with the production of coke, petroleum, natural gas, stone, clay, salt, and many other non-metallic minerals, iron ores, steel, gold and silver, copper, lead, other metals, and coal, both in the United States and in other countries.

United States—Montana. **Weed and Pirsson**

Geology and Mineral Resources of the Judith Mountains of Montana. By W. H. Weed and L. V. Pirsson.—Eighteenth Annual Report of the U.S. Geological Survey, Part iii. pp. 437–616. *Maps and Illustrations.* [Annual Reports of the Department of the Interior, 1897.] Washington, 1897.

United States—Nantucket. *J. Geology* 7 (1899): 226–236. **Curtis and Woodworth.**

Nantucket, a Morainal Island. By G. C. Curtis and J. B. Woodworth. *With Map and Illustration.*

United States—Naval Observatory. ——

Report of the Superintendent of the United States Naval Observatory for the Fiscal Year ending June 30, 1898. Washington, 1898. Size 9 × 6, pp. 20. *Presented by the U.S. Naval Observatory.*

United States—New England. **Wilson.**

Reading List, Colonial New England. By Minnie Cornwell Wilson.—University of the State of New York. State Library Bulletin, Bibliography No. 2, April, 1897. Albany, 1897. Size 10 × 7, pp. 19–33.

United States—New York. **Brigham.**

The Eastern Gateway of the United States. By Prof. A. P. Brigham. (From the *Geographical Journal* for May, 1899) Size 10 × 6½, pp. 12. *Map.*

On the Mohawk valley.

United States—Omaha Tribe. *Rep. Smithsonian I.* 1897 (1898): 577–586. **Fletcher.**

A study from the Omaha Tribe: the Import of the Totem. By Alice C. Fletcher. *With Illustrations.*

United States—Oregon. *Rep. Smithsonian I.* 1897 (1898): 369–379. **Diller.**
Crater Lake, Oregon. By J. S. Diller. *With Map and Plates.*

United States—Public Lands. **West.**
The Public Domain of the United States. By Max West.—Year-book of the U.S. Department of Agriculture, 1898. Washington, 1899. Pp. 325–354.

United States—Puget Sound. **Willis.**
Some Coal-fields of Puget Sound. By Bailey Willis.—Eighteenth Annual Report of the U.S. Geological Survey, Part iii. pp. 393–436. *Maps, Sections.* [Annual Reports of the Department of the Interior, 1897.] Washington, 1897.

United States—Rivers. **Davis.**
Report of progress of stream measurements for the calendar year 1896. By A. P. Davis.—Eighteenth Annual Report of the U.S. Geological Survey, Part iv. pp. 13–418. *Maps and Plates.* [Annual Reports of the Department of the Interior, 1897.] Washington, 1897.

These reports on stream measurements apply to nearly all the main rivers of the United States. The reports are illustrated by maps, diagrams of seasonal river-discharge, and views.

United States—South Dakota. **Darton.**
New developments in Well-boring and Irrigation in Eastern South Dakota, 1896. By N. H. Darton.—Eighteenth Annual Report of the U.S. Geological Survey, Part iv. pp. 561–615. *Maps and Plates.* [Annual Reports of the Department of the Interior, 1897.] Washington, 1897.

United States—Texas. **Hill and Vaughan.**
Geology of the Edwards Plateau and Rio Grande Plain adjacent to Austin and San Antonio, Texas, with reference to the occurrence of underground waters. By Robert T. Hill and T. Wayland Vaughan.—Eighteenth Annual Report of the U.S. Geological Survey, Part ii. pp. 193–321. *Plates.* [Annual Reports of the Department of the Interior, 1897.] Washington, 1897.

United States—Washington. **Russell and Smith.**
Glaciers of Mount Rainier; with a paper by G. O. Smith on The rocks of Mount Rainier.—Eighteenth Annual Report of the U.S. Geological Survey, Part ii. pp. 349–423. *Maps and Plates.* [Annual Reports of the Department of the Interior, 1897.] Washington, 1897.

United States—Yellowstone. *J. Geology* 7 (1899): 261–271. **Goode.**
The Piracy of the Yellowstone. By J. P. Goode. *With Maps.*

CENTRAL AND SOUTH AMERICA.

Argentine Republic. **Berg.**
Anales del Museo Nacional de Buenos Aires. Segunda Serie, publicada por el Prof. Dr. Carlos Berg. Tomo vi. (Ser. 2ª, t. iii.) Buenos Aires, 1899. Size 11 × 7, pp. 418 and 50. *Plates. Presented by the Museo Nacional de Buenos Aires.*

Contains papers on various departments of the natural history of the Argentine Republic, especially the flora.

Argentine Republic. **Nagar.**
Argentina. Il Distretto consolare di La Plata. Rapporto del cav. Carlo Nagar. —Bollettino del Ministero degli Affari Esteri. Giugno, 1899. Roma, 1899. Size 9 × 6½, pp. 72.

Bolivia. **Conway.**
Explorations in the Bolivian Andes. By Sir Martin Conway. From the *Geographical Journal* for July, 1899. Size 10 × 6½, pp. 22. *Map and Illustrations.*

Brazil. *Verh. Ges. Erdk. Berlin* **26** (1899): 261–265. **Meyer.**
Herr Dr. Herrmann Meyer über seine zweite Reise in Central-Bresilien (IV. Schingú-Expedition).

Jamaica. ——
Correspondence relating to the Public Finance and Resources of the Island of Jamaica. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. 24. *Price* 2½*d.*

Peru. ——
Geographical and Statistical Synopsis of Peru, 1895 to 1898. Lima, 1899. Size 11 × 7½, pp. 38. *Presented by the Consul-General for Peru in London.*

A summary of the actual condition of Peru, especially with regard to the economic condition of the country.

Peru—Amazon. *C. Rd. S.G. Paris* (1899): 176–183. **Viellerobe.**
Hautes régions des Amazones. Mission A. Viellerobe. *With Map.*

Trinidad. *Quarterly J. Geolog. S.* **55** (1899): 177–189. **Harrison and Jukes-Browne.**
The Oceanic Deposits of Trinidad (British West Indies). By Prof. J. B. Harrison and A. J. Jukes-Browne. *With Map and Sections.*

Trinidad. *J.R. Colonial I.* **30** (1899): 409–435. **Robinson.**
Trinidad: its Capabilities and Prominent Products. By Sir William Robinson, G.C.M.G.

AUSTRALASIA AND PACIFIC ISLANDS.

Australasia. *Rep. Australasian Assoc.* **7** (1898): 87–108. ———
On the Composition and Properties of the Mineral Waters of Australasia.

Australasia. **Coghlan.**
A Statistical Account of the Seven Colonies of Australasia, 1897–8. By T. A. Coghlan. Sydney, 1898. Size 9 × 6, pp. xiv. and 544. *Map. Presented by the Agent-General for New South Wales.*

A comparison of the resources and progress of the different colonies of Australasia.

Australasia—Seismology. *Rep. Australasian Assoc.* **7** (1898): 57–70. ———
On Seismological Phenomena in Australasia.

Contains a complete list of earthquakes observed in New Zealand from January, 1894, to August, 1897, and also lists of earthquakes in South Australia, and at Tanna, in the New Hebrides.

Australia. *B.S.G. Paris* **20** (1899): 214–219. **Barclay.**
Au travers du continent australien. Par le Capitaine H. Vere Barclay. *With Profiles.*

On the determination of the meridian separating the northern territory of South Australia from Queensland in 1877.

Easter Island. *C. Rd. S.G. Paris* (1899): 169–176. **Barclay.**
Mission à l'île de Pâques. Par le Capitaine H. Vere Barclay. *With Map.*

The author describes Easter island from a visit made by H.M.S. *Topaze*, but does not give the date. H.M.S. *Topaze* visited Easter Island in 1868, and her visit is described in the *Journal* of the Royal Geographical Society for 1870.

Ellice Group—Zoology. **Hedley.**
Australian Museum, Sydney, Memoir III. The Atoll of Funafuti, Ellice Group: its Zoology, Botany, Ethnology, and General Structure, based on collections made by Mr. Charles Hedley, of the Australian Museum, Sydney, N.S.W. Part 7. Published March 6, 1899. Sydney, 1899. Size 10 × 6½, pp. 371–488. *Illustrations. Presented by the Australian Museum.*

Hawaii. **Maxwell.**
The Hawaiian Islands. By Walter Maxwell. Year-Book of the U.S. Department of Agriculture, 1898. Washington, 1899, pp. 563–582.

New Caledonia. *Questions Dipl. et Colon.* **7** (1899): 34–39. **Jouannin.**
La Situation économique de la Nouvelle-Calédonie. Par André Jouannin.

New South Wales. *Nineteenth Century* **45** (1899): 962–972. **Huxley.**
The Gold Diggings at Bathurst in 1851. By Mrs. Huxley.

Tahiti. *Globus* **75** (1899): 369–372. ———
Die Tahitier unter französischer Herrschaft. *With Illustrations.*

Western Australia. **Chambers.**
Western Australia, its Position and Prospects. Written and compiled by Trant Chambers. With an Introduction by His Excellency Lieut.-Col. Sir Gerard Smith, K.C.M.G. Perth, 1899. Size 8½ × 5½, pp. viii. and 152. *Maps and Illustrations. Presented by the Victoria Public Library of Western Australia.*

An up-to-date official description of the resources and the development of Western Australia, written with the object of bringing the advantages of the country to the notice of possible immigrants.

POLAR REGIONS.

Antarctic. *Nature* **60** (1899): 202–203. ———
The Plans for Antarctic Exploration.

Antarctic. *Rep. Australasian Assoc.* 7 (1898): 709–712. **King.**
Antarctic and Southern Exploration. By the Hon. P. G. King.

Antarctic. *M.V. Erdk. Leipzig* (1898): 1–16. **Neger.**
Die botanischen Ziele der Südpolar-Forschung. Von Dr. F. W. Neger.

On the botanical results to be expected from researches during antarctic exploration.

Antarctic—Belgian Expedition. *B.S.R. Belge G.* 23 (1899): 125–135. ——
Expédition Antarctique Belge.

Arctic. **Ramondini.**
Dottor C. Ramondini. La via al Polo Nord Breve critica della geografia fisica. Reggio Calabria, 1899. Size 10 × 7, pp. 56. *Presented by the Author.*

Greenland. **Nathorst.**
Förslag till en expedition till östra Grönland för Andrées och hans följeslagares efter-forskande. Stockholm: Isaac Marcus, 1899. Size 8½ × 5½, pp. 8. *Presented by the Author.*

Plan of Prof. Nathorst's proposed Andrée search expedition to East Greenland.

Polar Exploration. *Ann. Hydrographie* 27 (1899): 201–217. **Makaroff.**
Ueber die Befahrung der Meere hoher Breiten mit Hülfe von Eisbrechern. Nach Admiral S. O. Makaroff. *With Plate.*

Spitsbergen—Plants. **Andersson and Hesselman.**
Verzeichnis der in König Karls Land während der schwedischen Polarexpedition 1898 gefundenen Phanerogamen. Von Gunnar Andersson und Henrik Hesselman. (Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar, 1898, No. 8. Stockholm.) Size 8½ × 5½, pp. [4.] *Presented by the Authors.*

Spitsbergen Seas. **Monaco.**
Exploration océanographique aux régions polaires. Par S. A. S. le prince Albert I[er] de Monaco. Extrait du *Bulletin du Muséum d'histoire naturelle*, 1899, No. 1, p. 6. Paris, 1899. Size 9½ × 6½, pp. 12. *Illustrations. Presented by H.S.H. the Prince of Monaco.*

A short account of the cruise of the *Princesse Alice* to Spitsbergen in 1898.

MATHEMATICAL GEOGRAPHY.

Admiralty Surveys. **Wharton.**
Navy.—Hydrographer's Report. Report on Admiralty Surveys for the year 1898, by the Hydrographer. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. 16. *Price 2d.*

Angular Measurement. *C. Rd.* 128 (1899): 1442–1443. **Caspari.**
Epreuves des instruments destinés aux expériences sur la décimalisation des angles. Note de M. Caspari.

Barometric Altitudes. *Rep. Australasian Assoc.* 7 (1898): 702–708. **Fowler.**
The Determination of Heights by Barometric Methods. By Thos. Walker Fowler.

Cartography—Contour-lines. *Riv. G. Italiana* 6 (1899): 393–402. **Marinelli.**
Brevi considerazioni sull' impiego delle curve isometriche. Per Olinto Marinelli.

Cartography—Large-scale Maps. *C. Rd.* 128 (1899): 1546–1549. **Lapparent.**
Rapport sur le projet de réfection de la Carte de France. Par M. de Lapparent.

Report of a committee to urge on the French Government the importance of constructing a detailed map of France on the scale of 1 : 10,000.

Geodesy—Figure of the Earth. *Riv. G. Italiana* 6 (1899): 403–409. **Saija.**
Sull' ellissoide terrestre adottato nel collegamento geodetico della Spagna coll' Algeria. Nota di G. Saija.

Gravity Observations. ——
Veröffentlichungen des Hydrographischen Amtes der k. und k. Kriegs-Marine in Pola. Gruppe III. Relative Schwerebestimmungen durch Pendelbeobachtungen. II. Heft. Beobachtungen in den Jahren 1895–1898 während der Reisen S. M. Schiffe "Albatros," "Saida," "Zrinyi," und "Panther." Pola, 1898. Size 13 × 10, pp. 94. *Presented by the Austro-Hungarian Marine Department.*

Observations on the force of gravity carried out by pendulum-readings in a number of harbours in the far east and south.

Latitude. **Battermann.**
Centralbureau der Internationalen Erdmessung. Resultate aus den Polhöhenbestimmungen in Berlin ausgeführt in den Jahren 1891 und 1892 am Universal-Transit der Konigl. Sternwarte. Von Dr. H. Battermann. Berlin: G. Reimer, 1899. Size 11½ × 9, pp. 46.

On the determinations of latitude at the Berlin observatory in order to investigate the variations of latitude.

Latitude Variations. **Albrecht.**
Central Bureau der Internationalen Erdmessung. Bericht über den Stand der Erforschung der Breitenvariation am Schlusse des Jahres, 1898. Von Th. Albrecht. Berlin: G. Reimer, 1899. Size 11½ × 9, pp. 22. *Plate.*

Longitudes. *Ann. Hydrographie* 27 (1899): 191-201. **Gelcich.**
Die Schlussrechnung bei der Längenbestimmung aus Monddistanzen vor dem Erscheinen des 'Nautical Almanach.' Von E. Gelcich.

On the determination of longitude by lunar distances in the eighteenth century before the establishment of the 'Nautical Almanac.'

Map Projections. **Hammer.**
Nova Acta, Abh. K. Leop.-Carol. Deutsch. A. Naturforscher 71 (1898): 447-470.
Vergleichung einiger Abbildungen eines kleinen Stücks der ellipsoidischen Erdoberfläche (Karte von S. W. Deutschland). Von E. Hammer.

A comparison of various projections which might be utilised for a map of Württemberg, the limits of which are 47° 10′ and 49° 50′ N., and which extends for 1° 50′ on each side of the central meridian.

Photographic Surveying. *M. k. u. k. Militär G.I.* 18, 1898 (1899): 93-96. **Hübl.**
Das photogrammetrische Höhenmessen. Von Arthur Freiherrn von Hübl.

On the determination of heights by means of photography.

Surveying Instruments. **Scott.**
The Evolution of Mine-Surveying Instruments. By Dunbar D. Scott. [*Transactions of the American Institute of Mining Engineers.*] (Buffalo Meeting, October, 1898.) Size 9 × 6, pp. 68. *Illustrations. Presented by the Author.*

This is an interesting history of instruments used in mine-surveying from an early time, and is illustrated by a series of pictures of theodolites and other appliances of different periods and different countries.

Time-measurement. *C. Rd.* 128 (1899): 1137-1142. **Lippmann.**
Sur la mesure absolue du temps, déduite des lois de l'attraction universelle. Note de M. G. Lippmann.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Atmospheric Electricity. **McAdie and Henry.**
Lightning and the Electricity of the Air. In two parts. Prepared by Alexander G. McAdie and Alfred J. Henry. U.S. Department of Agriculture, Weather Bureau. Bulletin No. 26. Washington, 1899. Size 9 × 6, pp. 74. *Map and Illustrations.*

Aurora. *Bihang K. Svensk. Vet.-A. Handlingar* 24 (1899): 1-18. **Bohlin.**
Ueber eine sonderbare am 2 Januar 1897 beobachtete Nordlichterscheinung. Von Karl Bohlin. *With Plates.*

Coast-lines. *P. American A. Arts and Sci.* 34 (1899): 151-258. **Gulliver.**
Shoreline Topography. By F. P. Gulliver. *With Maps.*

Geomorphology. **Davis.**
The Peneplain. By W. M. Davis. From the *American Geologist*, vol. xxii., April, 1899. Size 9½ × 6½, pp. 207-239. *Plate.*

A reply to Prof. Tarr's criticism of Prof. Davis's views on the origin of plains of sub-aerial erosion.

Meteorology of the Oceans. *Ann. Hydrographie* 27 (1899): 255-261. **Köppen.**
Ist die Veröffentlichung von Einzelbeobachtungen vom Ozean anzustreben? Von Dr. W. Köppen.

On the value of the meteorological observations made on board individual ships.

Meteorology—Temperature. **Satke.**
Nova Acta, Abh. K. Leop.-Carol. Deutsch. A. Naturforscher 71 (1897): 103–206.
Ueber den Zusammenhang der Temperatur aufeinander folgender Monate und Jahreszeiten. Von L. Satke.

Meteorology—Upper Air. *Rep. Smithsonian I.*, 1897 (1898): 301–316. **Graffigny.**
Explorations of the Upper Atmosphere. By Henri de Graffigny. *With Diagrams.*

Meteorology—Upper Air. **Marvin.**
The Use of Kites in the Exploration of the Upper Air. By C. F. Marvin. Yearbook of the U.S. Department of Agriculture, 1898. Washington, 1899. Pp. 201–212. *Illustrations.*

Meteorology—Upper Air. *Rep. Smithsonian I.*, 1897 (1898): 317–324. **Rotch.**
The Exploration of the Free Air by means of Kites at Blue Hill Observatory, Massachusetts. By A. Lawrence Rotch. *With Plates.*

Meteorology—Water-spouts. **Russell.**
Water-spouts on the Coast of New South Wales. By H. C. Russell. [Read before the Royal Society of N. S. Wales, August 3, 1898.] Size 9 × 6, pp. 18. *Plates. Presented by the Author.*

Meteorology—Wind. *Meteorolog. Z.*, 16 (1899): 204–215. **Billwiller.**
Ueber verschiedene Entstehungsarten und Erscheinungsformen des Föhns. Von R. Billwiller.

Oceanographical Museum. *Rev. Scientifique* 11 (1899): 591–593. ———
Le Musée océanographique de Monaco.

Oceanography. *Sitzb. A.W. Berlin* (1899): 384–400. **Lohmann.**
Untersuchungen über den Auftrieb der Strasse von Messina mit besonderer Berücksichtigung der Appendicularien und Challengerien. Von Dr. H. Lohmann.

Oceanography. *G.Z.* 5 (1899): 190–209, 252–260. **Natterer.**
Chemisch-geologische Tiefsee-Forschung. (Expeditionen der Schiffe "Pola" und "Taurus" in das östliche Mittelmeer, Marmara-Meer und Rote-Meer.) Von Dr. Konrad Natterer. *With Chart.*

Oceanography. *Ann. Hydrographie* 27 (1899): 227–236. **Schott.**
Von der deutschen Tiefsee-Expedition. Nach dem Bericht des Ozeanographen der Expedition Dr. Gerhard Schott. *With Chart.*

Plant-Geography. *Ann. G.* 8 (1899): 193–206. **Flahault.**
La géographie des plantes avec la physiologie pour base. Par M. Ch. Flahault.

River-temperature. **Barnes**
On some Measurements of the Temperature of the Lachine Rapids. By Howard T. Barnes, McGill University. Papers from the Department of Physics. No. 8. (Reprinted from the *Transactions of the Royal Society for Canada*, 1897, Section iii., pp. 17–30.) Montreal, 1898. Size 10 × 6½.

The observations were made by means of platinum resistance thermometers, and directly compared the open river-water of the rapids with a standard mixture of snow and river water, which allowed of readings being taken to one-thousandth of a degree. The water was found never to fall below the freezing point to as much as one-hundredth of a degree, but usually remained about three hundredths of a degree Centigrade above.

Seismology. *Brit. Assoc. Rep.* (1898): 179–276. **Milne and others.**
Seismological Investigations. Third Report of the Committee.

Speleology. *Abh. G. Ges. Wien* 1 (1899): 15–76. **Crammer.**
Eishöhlen- und Windröhren-Studien. Von Prof. Hans Crammer. *With Plans and Diagrams.*

Terrestrial Magnetism. *Brit. Assoc. Rep.* (1898): 80–136. **Ellis and Adams.**
Comparing and Reducing Magnetic Observations.—Report of the Committee. I. Magnetic Results at Greenwich and Kew Discussed and Compared, 1889 to 1896. By William Ellis, F.R.S. II. Account of the Late Prof. John Couch Adams's Determination of the Gaussian Magnetic Constants. By Prof. W. G. Adams, F.R.S.

Terrestrial Magnetism. **Fritsche.**
Die Elemente des Erdmagnetismus für die Epochen 1600, 1650, 1700, 1780, 1842 und 1885, und ihre Saecularen Aenderungen, berechnet mit Hülfe der aus allen

brauchbaren Beobachtungen abgeleiteten Coefficienten der Gaussichen "Allgemeinen Theorie des Erdmagnetismus" von Dr. H. Fritsche. St. Petersburg, 1899. Size 9 × 6½, pp. 112. *Presented by the Author.*

These tables are printed in facsimile of the author's MS.

Terrestrial Magnetism. *Sitzb. A. W. Berlin* (1899): 236-246. **Lüdeling.**
Ueber den täglichen Gang der erdmagnetischen Störungen an Polarstationen. Von Dr. G. Lüdeling. *With Plate.*

Terrestrial Magnetism. **Wild.**
Vierteljahrsb. Naturforsch. Ges. Zürich 43 (1898): 253-275.
Ueber die Bestimmung der erdmagnetischen Inklination und ihrer Variationen. Von H. Wild.

Zoogeography. **Grevé.**
Nova Acta, Abh. K. Leop.-Carol. Deutsch. A. Naturforscher 70 (1898): 289-377.
Die geographische Verbreitung der jetzt lebenden Perissodactyla, Lamnungnia und Artiodactyla non ruminantia. Von Carl Grevé. *With Maps.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

America—People. *Science* 9 (1899): 795-796. ——
Amerind—A Designation for the Aboriginal Tribes of the American Hemisphere.

A suggestion to introduce the term *Amerind* as a collective name for the Aborigines of America, the new word being obviously a contraction for "American Indian."

Colonization. *Quarterly Rev.* 190 (1899): 268-288. ——
Climate and Colonization.

Colonization. *Riv. G. Italiana* 6 (1899): 257-270, 345-356. **Ricchieri.**
Colonizzazione e Conquista. Dal Prof. Giuseppe Ricchieri.

Commercial Geography—Sugar. *J. R. Statistical S.* 62 (1899): 296-347. **Martineau.**
The Statistical Aspect of the Sugar Question. By George Martineau.

Studies the production of cane and beet sugar for twenty-five years, and especially discusses the production of beet sugar in France and Germany, Austria, Belgium and Holland, and Russia.

Commercial Geography—Wheat. *Brit. Assoc. Rep.* (1898): 3-38. **Crookes.**
Address by Sir William Crookes, F.R.S., President.

On the possibility of the exhaustion of the world's wheat-supply.

Historical—Ancient Altitudes. *Riv. G. Italiana* 6 (1899): 298-299. **Bertolini.**
Sulla determinazione delle altitudini presso gli antichi: a proposito dello scritto della signorina Bittanti. Nota del Prof. G. Lodovico Bertolini.

On the knowledge of the Latin writers as to the height of the Alps, a criticism of a previous paper.

Political Geography. *Nineteenth Century* 45 (1899): 991-1006. **Taylor.**
Sea-Power and Sea-Carriage. By Benjamin Taylor.

Political Geography—Cities. *Fortnightly Rev.* 65 (1899): 943-954. **Little.**
Two Cities: London and Peking. By Archibald Little.

On the historical development of London and Peking.

Primitive Houses. *Ann. G.* 8 (1899): 207-230. **Bertaux.**
Étude d'un type d'habitation primitive, Trulli, caselle et specchie des Pouilles. Par M. E. Bertaux. *With Map and Illustrations.*

BIOGRAPHY.

Heddle. *T. Edinburgh Geolog. S.* 7 (1899): 317-327. **Goodchild.**
Dr. Heddle and his Geological Work. By J. G. Goodchild. *With Portrait.*

Dr. Heddle, most distinguished by his geognostic researches, was one of the first to urge the importance of extending the geological survey to Scotland.

Leitner. *J. R. Asiatic S.* (1899): 725-729. ——
Dr. G. W. Leitner.

Manen. *Rev. Maritime* 141 (1899): 292-300. **Héraud.**
Léopold Manen, ingenieur hydrographe en chef de la marine (1829-1897). Par M. G. Héraud.

Simony. **Böhm.**

Zur Biographie Friedrich Simony's. Von Dr. August Böhm Edlen von Böhmersheim. Wien: R. Lechner (Wilh. Müller), 1899. Size 11 × 7¼, pp. 62. *Presented by the Author.*

GENERAL.

Anglo-Jewish Association. ——

The Twenty-Eighth Annual Report of the Anglo-Jewish Association in connection with the Alliance Israélite Universelle, 1898-99. London, 1899. Size 8¼ × 5¼, pp. 116. *Map. Presented by the Association.*

Art of Travel. *Rev. Scientifique* 12 (1899): 1–6. **Dybowski.**

Organisation d'un voyage d'exploration. Par M. Jean Dybowski.

Hints on equipment and organization for travelling in Africa, amongst which M. Dybowski gives precedence to the advice of an Arab chief, "Trust no one but yourself and your weapons."

Geography. *Rep. Smithsonian I.* 1897 (1898): 381–399. **Keltie.**

The Function and Field of Geography. By J. Scott Keltie, LL.D.

Jesup North Pacific Expedition. *Science* 9 (1899): 532–541. ——

Field-Work of the Jesup North Pacific Expedition in 1898.

This is noticed in the *Journal* for July, p. 96.

Malaria. **Grassi, Bignami, and Bastianelli.**

Atti R.A. Lincei, Rendiconti 8 (1899): 434–438.

Ulteriori ricerche sulla malaria, 4ª Nota preliminare del Socio B. Grassi, A. Bignami e G. Bastianelli.

Mountaineering. **Gribble.**

The Early Mountaineers. By Francis Gribble. London: T. Fisher Unwin, 1899. Size 9 × 6, pp. xiv. and 338. *Illustrations. Price 21s. Presented by the Publisher.*

Describes the first mountaineers on each of the great mountain systems of Europe, and deals especially with the first references to mountain-climbing in early books. A number of reproductions of quaint maps, views, and title-pages adds much interest to the descriptions. A series of appendices contains the *ipsissima verba* of some of the most ancient descriptions.

Scientific Societies—Year-Book. ——

Year-Book of the Scientific and Learned Societies of Great Britain and Ireland: comprising Lists of the Papers read during 1898 before Societies engaged in Fourteen Departments of Research, with the names of their Authors. Sixteenth Annual Issue. London: C. Griffin & Co., 1899. Size 9 × 5½, pp. iv. and 288. *Presented by the Publishers.*

Shipwrecks. *Ann. Hydrographie* 27 (1899): 239–255. **Herrmann.**

Ort und Ursache der Strandungen deutscher Seeschiffe. Von J. Herrmann.

Statements as to the positions in which German vessels have been lost in all parts of the world.

Swiss Geographical Congress. ——

XII^{me} Congrès des Sociétés Suisses de Géographie tenu à Genève du 4 au 7 Septembre 1898.—Le Globe. Numéro Spécial. Genève, 1898. Size 10 × 6½, pp. 96. *Presented by the Geographical Society of Geneva.*

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Bartholomew.**

Bartholomew's Reduced Ordnance Survey of England and Wales. Scale 1 : 126,720 or 2 stat. miles to an inch. Sheets: 29, Berks and Wilts; 36, South Devon. J. Bartholomew & Co., Edinburgh, 1899. *Price 2s. each,* mounted on cloth. *Presented by the Publishers.*

England and Wales. **Ordnance Survey.**

Publications issued since July 8, 1899.

1-inch—General Maps:—

ENGLAND AND WALES:—150 (revision), engraved in outline; 93, 98, 205, 277, 293, 295, 323, 324, 337, 347 (revision), hills engraved in black or brown. 1*s. each.*

6-inch—County Maps:—

ENGLAND AND WALES:—**Derbyshire,** 6 N.E., 22 S.W., S.E. **Hertfordshire,** 6 S.E., 25 N.W., S.E. **Northumberland,** 1 S.E., 3 S.W., 97 S.W. **Sussex,** 47 S.W.

25-inch—Parish Maps:—

ENGLAND AND WALES:—**Berkshire,** V. 12; VI. 9, 10, 11, 14; VII. 2, 3, 10; IX. 3, 4, 7, 8; X. 3; XXIV. 1; XXX. 14; XXXVIII. 4, 6, 7, 8, 10, 12, 16; XXXIX. 14, 15, 16; XL. 9, 13; XLVI. 3, 4, 6, 7, 8, 10, 11, 12. **Bucks,** XXVI. 6, 7, 10, 11; XXXI. 7; LII. 1; LVIII. 8. **Cheshire,** VII. 15; XIII. 14. **Cumberland,** XXXIII. 16; XXXIV. 5, 9, 10, 13, 14, 15; XLI. 4; XLII. 1, 3, 5, 6, 7; LXVI. 6; LXVII. 7, 13; LXVIII. 5, 13; LXXII. 1 and 5, 2; LXXIII. 1. **Derby,** XXXII. 12; XXXIII. 5, 7, 8, 12; XXXVI. 1. **Denbigh,** VA. 15; IX. 15; XIV. 4, 8, 12; XV. 9; XX. 3, 11; XXIX. 1, 5, 9, 13; XXXVI. 1. **Flint,** I. 8, 12; II. 5; IV. 8, 12; V. 2, 5, 8, 13, 15; VI. 13, 15, 16; VIII. 10, 11, 15, 16: IX. 3, 5, 9, 13, 14; X. 10; XII. 4, 8, 12; XIII. 3, 9; XVI. 3, 11; XVII. 5; XX. 1; XXII. 9. **Glamorgan,** XV. 9; XXIV. 4; XXV. 10, 14, 15; XXVI. 4, 13, 14; XXXIII. 3, 4, 7, 8; XXXIV. 1, 3, 7, 9, 10, 14, 16; XXXIX. 3, 4; XLIV. 12, 16. **Nottinghamshire,** VI. 2, 3, 4, 6, 7, 8, 9, 10, 11, 12; VII. 1, 2, 3, 4, 5, 6, 7, 9, 10, 11; XXVII. 3. **Oxfordshire,** XXIV. 7, 8, 11, 12, 15, 16; XXVI. 5, 6, 9, 10, 13, 14; XXVII. 6, 7, 8, 11, 12; XXVIII. 5, 6, 7, 9, 10, 11; XXX. 2, 3; XXXII. 1, 2, 3, 4, 5; XXXIV. 2, 7, 10, 14; XXXVI. 2; XXXVIII. 12; XXXIX. 11; XL. 1, 5, 9, 13; XLIII. 3; XLVI. 1. **Staffordshire,** VII. 4; VIII. 6, 9; IX. 12, 15; XIV. 2, 10, 11. **Sussex,** XXVII. 1; LIV. 13; LVIII. 7, 8, 12; LIX. 13; LXVII. 11, 14, 16; LXVIII. 1, 2, 6, 7, 9, 11, 14, 15, 16; LXIX. 1, 5, 14, 15, 16; LXXVIII. 1, 5; LXXIX. 2, 4, 5, 7, 11, 15, 16; LXXX. 5, 6; LXXXII. 3, 4.

(*E. Stanford, Agent.*)

Germany. **Topogr. Bureau des K. Bayer. General-Stabes.**

Karte des Deutschen Reiches. Herausgegeben vom Topogr. Bureau des K. Bayer. General-Stabes, 1898. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Sheets: 665, Schliersee; 672, Mittenwald. *Price* 1.50 *marks each sheet.*

Italy. **Istituto Geografico Militare, Firenze.**

Carta d'Italia. Scale 1 : 100,000 or 1·6 stat. mile to an inch. F°. 5, Val Formazza; 7, Pizzo Bernina; 11, M. Marmolada; 12, Piere di Cadore; 13, Ampezzo; 14, Pontebba; 15, Domodossola; 18, Sondrio; 19, Tirano; 23, Belluno; 24, Maniago; 25, Udine; 29, Monte Rosa; 32, Como; 33, Bergamo; 38, Conegliano; 39, Pordenone; 40, Palmanova; 98, Vergato; 99, Faenza; 100, Forli; 101, Rimini; 107, Monte Falterona; 108, Mercato Saraceno; 109, Pesaro; 110, Senigallia; 113, S. Casciano in Val di Pesa; 114, Arezzo; 115, Citta di Castello; 116, Gubbio; 117, Jesi; 118, Ancona; 120, Siena; 121, Montepulciano; 122, Perugia; 123, Gualdo Tadino; 124, Macerata; 125, Fermo; 126, Isola d'Elba; 127, Piombino; 128, Grosseto; 130, Orvieto; 131, Foligno; 132, Norcia; 133, Ascoli Piceno; 134, Giulianova; 135, Orbetello; 136, Toscanella; 166, Isola Asinara; 167, Isola Rossa; 179, Porto Torres. Istituto Geografico Militare, Firenze. *Price* 1 *lire* 50 *centimes each sheet.*

Sweden. **Sveriges Geologiska Undersökning.**

Sveriges Geologiska Undersökning. Scale 1 : 50,000 or 0·8 stat. mile to an inch. Sheet: Örkelljunga. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Sheet: Ulricehamn. Öfversightskarta angifrande de Kvartära Hafsaflagringarnes område samt Kalkstensoch Mergelförekomsters utbredning. Scale 1 : 2,000,000 or 32 stat. miles to an inch. Tryckt i General Stabens Litogr. Anstalt, Stockholm. *Presented by the Director of the Geological Survey of Sweden.*

ASIA.

Asia Minor. **Friedrich and Ruge.**

Archäologische Karte von Kleinasien, bearbeitet von Dr. W. Ruge u. Dr. E. Friedrich. Scale 1 : 2,500,000 or 39·5 stat. miles to an inch. Verlag v. G. Sternkopf, Halle a/S. 1899. *Price* 3 *marks. Presented by the Publisher.*

Students will find this a useful map, as all the ancient, as well as modern, names of

places are given. There are two insets, one showing recent routes, and the other the Plain of Troy. It is furnished with a complete index.

China. **Cholnoky.**

Map of the Mouth of the Yang-tse-kiang, and surrounding country. Scale 1 : 1,300,000 or 20·5 stat. miles to an inch. By Eug. de Cholnoky. 1899. In Hungarian. ***Presented by the Author.***

This map of the delta of the Yang-tse-kiang contains some new work, which would appear to be the result of the author's survey. The title and explanation of the symbols employed are in Hungarian.

AFRICA.

Transvaal. **Stanford.**

Map of the South African Republic (Transvaal). Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. London: E. Stanford, 1899. ***Presented by the Publisher.***

This map has been brought up to date. All means of communication are shown, and the heights of some prominent positions are given in figures. As there is no hill-shading, there is nothing to indicate the relief of the country; it is, however, a useful map for reference.

AMERICA.

Canada. **Surveyor-General of Canada.**

Sectional Maps. Scale 1 : 190,080 or 3 stat. miles to an inch. Sheet: 96, Port Moody. Topographical Surveys Branch, Department of the Interior, Ottawa, 1899. *Presented by the Surveyor-General of Canada.*

GENERAL.

World. **Meyer.**

Meyer's Hand-Atlas. Zweite, neubearbeitete und vermehrte Auflage mit 112 Kartenblättern, 9 Textbeilagen und Register aller auf den Karten verzeichneten Namen. Part 15 and 16. Leipzig und Wien. Verlag des Bibliographischen Instituts, 1899. *Price* 60 *pf.*

World. **Vivien de Saint Martin and Schrader.**

Atlas Universel de Géographie. Ouvrage commencé par M. Vivien de Saint Martin et continué par Fr. Schrader. Paris: Librarie Hachette et Cie. Sheets: Russie d'Europe; Afrique Français. *Price* 2 *fr.*

These two issues contain maps of Russia in Europe, and sheet 2 of the French possessions in Africa. Each sheet is accompanied by letterpress, in which the authorities consulted are mentioned.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, May and June, 1899. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
3049 to 3060		Tidal streams:—English and Irish channels. 4*s.* The same twelve charts bound together in an atlas. 5*s.*
4021 m	= 14·0	England, east coast:—River Medway between Pinup and Chatham reaches. 2*s.* 6*d.*
114B m	= 3·0	Firth of Forth:—Fisherrow to Port Edgar. 2*s.* 6*d.*
3023 m	= 5·0	Ireland, north coast:—Buncrana and Rathmullan anchorages. 1*s.* 6*d.*
2970 m	= 0·33	Novaya Zemlya, west coast:—Sukhoi Nos to North Gusini Nos. (Plan:—Pamorskaya bay). 2*s.* 6*d.*
3034 m	= {2·15, 1·25}	Plans in Novaya Zemlya:—Byelushya bay, anchorages on the north side of Kara strait. 1*s.* 6*d.*
3020 m	= var.	Anchorages on the west coast of Spitsbergen:—Anchorages between Vogel Sang and Cloren cliff, Kobbe bay, Bloomstrands harbour, Coal haven, Sassen and Temple bays, Coal bay, Green harbour, Middle Hook haven, Fleur de Lys and Bourbon havens, Bjona haven. 1*s.* 6*d.*
3043 m	= 5·2	Little Belt:—Gienner fiord. 1*s.* 6*d.*
779 m	= 0·53	North America, east coast:—The strait of Belle isle. 2*s.* 6*d.*
3016 m	= 0·5	Newfoundland, west coast:—Cow head to Rich point. 2*s.* 6*d.*

3042 m = var. Harbours and anchorages in the Bahamas:—Pelican harbour, southern extremity of Great Abaco island, southern portion of the Berry islands, part of the Jumentos cays. 2*s*. 6*d*.

99 m = $\begin{Bmatrix}3\cdot9\\5\cdot2\end{Bmatrix}$ Plans on the east coast of South America:—Approaches to Nickerie river, Salut isles anchorage (reproduction). 1*s*. 6*d*.

607 m = $\begin{Bmatrix}0\cdot9\\1\cdot8\end{Bmatrix}$ Africa, west coast:—Salem and Jumbas rivers, Fundium. 2*s*.

3047 m = var. Harbours and anchorages in the Red sea:—Sherm Sheikh, Sherm Sheikh and Sherm el Moiyah, Mersa Dhiba, Sherm Habban, Akabah, Shermen, Noman, Dahab. 1*s*. 6*d*.

3044 m = 0·91 Celebes:—Ujong Jonga to Ujong Kassi. 2*s*. 6*d*.

3037 m = 1·0 Korea:—Port Lazaref and Yung hing bay. 1*s*. 6*d*.

3019 m = 2·0 Japan:—Tsu Saki to Kagara Sima, with the channels to Imari. 2*s*. 6*d*.

3041 m = 2·15 Russian Tartary:—America bay. 1*s*. 6*d*.

3040 m = 4·2 Russian Tartary:—Vostok bay. 1*s*. 6*d*.

3095 m = 0·3 Sea of Okhotsk:—Cape Patience and Robben island (Plan:—Robben island). 1*s*. 6*d*.

1644 m = 0·17 Kamchatka:—Komandorski islands (Plans:—Nikolski anchorage, Staraya harbour, Peschanoi bay, Preobrazheniya harbour). 2*s*. 6*d*.

3088 m = 2·0 Anchorages on the east coast of Australia:—Home islands anchorage, Cape Weymouth anchorage, Night island anchorage, Howick island anchorage. 1*s*. 6*d*.

3027 m = var. Anchorages on the north coast of New Guinea:—Mambare bay, Porlock harbour, Tana Mera bay, Wooi bay, Tipin road, Berlin road and harbour, Berlin harbour. 1*s*. 6*d*.

3033 d = 2·7 New Hebrides islands and New Caledonia. 2*s*. 6*d*.

1531 Anchorages in strait of Belle isle:—Plans added, Carrol cove, Green island anchorage.

487 St. Christopher and Nevis:—Plans added, Basseterre bay.

1117 Anchorages in the Russian Tartary:—New Plan, Trinity bay.

984 Anchorages in the Marshall islands:—Plan added, Eniwetok or Brown atoll.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
114B	Fisherrow to Queensferry.	New chart. Fisherrow to Port Edgar	1146
1156	Nickerie river appoaches.	New chart.	
99	Salut isles anchorage.	Plans on the east coast of South America.	99
607	Entrances to the Salem and Jumbas rivers.	New plan. Salem and Jumbas rivers	607
54	Plan of Port Lazaref on this sheet.	New plan. Port Lazaref and Yung-hing bay	3037
2511	Plans of Nakhodka bay and Wrangle bay on this sheet.	New chart. America bay	3041
2407	Plan of Gaidamak bay on this sheet.	New chart. Vostok bay	3040
1644	Komandorski islands.	New chart. Komandorski islands	1644
778	Eniwetok or Brown group.	New plan. Eniwetok or Brown atoll	984
1380	New Caledonia, New Hebrides and Loyalty islands.	New chart. New Hebrides islands and New Caledonia	3033

Charts that have received Important Corrections.

No. 2585, England:—Coastguard stations. 2587, Ireland:—Coastguard stations. 1951, England, west coast:—Liverpool bay. 1192, England, east coast:—Hartlepool to St. Abbs head. 1626, England, east coast:—Blyth. 2593, Germany, west coast:—Ameland to Jade river. 1875, Germany, west coast:—Elbe, Weser, and Jade rivers. 2260, Norway:—Christiansand and Songvaar fiords. 2751, Spitsbergen. 185, Germany, north coast:—Port Swinemünde. 86, Spain, west coast:—Cadiz bay. 1187, Spain, east coast:—Alicante to Palamos. 1354B, Falkland islands. 260, North Polar sea. 274, North Polar chart, Atlantic side. 2282, Arctic ocean and Greenland sea. 282, Newfoundland:—Saint John bay to Orange bay. 2775, River St. Lawrence:—Point Pizeau to Frechette island. 2777, River

St. Lawrence:—Frechette island to Cape Santé. 2778, River St. Lawrence:—Cape Santé to Grondine. 2779, River St. Lawrence:—Grondine to Batiscan. 2780, River St. Lawrence:—Batiscan to Becancour. 2781, River St. Lawrence:—Becancour to port St. Francis. 2782, River St. Lawrence:—East part of Lake St. Peter. 2783, River St. Lawrence:—West part of Lake St. Peter. 2784, River St. Lawrence:—Stone island to Lanoraie. 2785, River St. Lawrence:—Lanoraie towards Contrecœur. 2786, River St. Lawrence:—Contrecœur to Repentigny. 2787, River St. Lawrence:—Repentigny to Long point. 2788, River St. Lawrence:—Long point to Lachine rapids. 1127, River St. Lawrence:—Montreal harbour. 2882, United States, east coast:—Gloucester harbour. 2486, United States, east coast:—Plymouth harbour. 2806, United States, east coast:—Charleston harbour. 478, Puerto Rico:—Port San Juan, Port Arecibo. 3005, United States, south coast:—Tortugas harbour. 3029, British Columbia:—Active pass to Gabriola pass. 2812, Africa, west coast:—Lagos harbour. 2432, Russian Tartary:—Tumen Ula to Strelok bay. 936B, New Caledonia, south-east part. 2069, New Caledonia:—Approaches to Port Nouméa. 480, New Caledonia:—Port Nouméa. 474, Friendly islands:—Nomuka islands.

(*J. D. Potter, Agent.*)

English and Irish Channels. **Hydrographic Department, Admiralty.**

Tidal Streams of the English and Irish Channels. Published at the Hydrographic Department, Admiralty, under the superintendence of Admiral Sir W. J. L. Wharton, Hydrographer, London, 1899. 12 sheets. *Price 5s.* *Presented by the Hydrographer.*

North Sea. ——

Tidal Streams of the North Sea. Published at the Hydrographic Department, Admiralty, under the superintendence of Admiral Sir W. J. L. Wharton, Hydrographer, London, 1899. 12 sheets. *Price 5s.* *Presented by the Hydrographer.*

These atlases each contain twelve charts, showing the direction and rate in knots of the tidal streams of the North sea and the English and Irish channels for every hour of the tide at Dover. They are based on the extensive observations made by the late Captain F. W. Beechy, R.N., F.R.S., and are supplemented, or verified, by the results of Admiralty surveys, and observations taken by permission of the Trinity House, at the different lightships round the coast.

With regard to the charts of the North sea, much valuable information concerning the tidal streams off the coast of Holland has been obtained from an account by Lieut. H. Bernelot Moens of the Dutch navy, of a series of careful observations made from 1880 to 1882. Observations made at the different lightships on the Danish, Dutch, Belgian, and French coasts have been furnished by the respective governments.

The charts of the English and Irish channels have been supplemented by observations from various Admiralty surveys up to date, especially by those, at the entrance of the channel, by Admiral Pelham Aldrich, R.N., in 1889–90.

The state of the tide, whether rising or falling, has been noted along the coast, and a notice is given that these are general statements for different portions of the coast, and necessarily apply to individual harbours or bays.

The compilation of this vast amount of material has been carried out by Commander Cortland H. Simpson, R.N.

Russian Charts. **Chief Hydrographic Department, Ministry of Marine, St. Petersburg.**

Charts and Plans published by the Chief Hydrographic Department, Ministry of Marine, St. Petersburg.

The White Sea.

No.
519. Plan of Suma. Scale 1750 feet to an inch. 1899.

The Baltic.

1810. Plan of Wismar bay. Scale 3700 feet to an inch. 1899.
528. Approaches to Arensburg. Scale 3500 feet to an inch. 1899.
524. Plan of Revel. Scale 188 feet to an inch. 1899.
522. Plan of port of Windau. Scale 420 feet to an inch. 1899.

Black Sea.

525. Plan of Karaji bay, Crimea. Scale 1400 feet to an inch. 1899.
449. Plan of Balaklava bay, Crimea. Scale 175 feet to an inch. 1896.
1760. Plan of the neighbourhood of Cape Khersonese, Crimea. Scale 1050 feet to an inch. 1899.
530. Plan of the Kilia mouth of the Danube. Scale 5250 feet to an inch. 1899.
526. Plan of Port Tuabs. Scale 1400 feet to an inch. 1899.
527. Plan of Bender Erekli bay. Scale 1365 feet to an inch. 1899.

Caspian Sea.

523. Plan of the Muravieff bay (with Krasnovodsk). Scale 1750 feet to an inch. 1899.

North Pacific Ocean.

520. Plan of Naisdnik bay (Askold island). Scale 1400 feet to an inch. 1898.
516. Eastern coast of the Korean peninsula. Scale 8·2 stat. miles to an inch. 1898.
515. Plan of the creeks of Trinity and Vitzay in the bay of Possiet. Scale 1400 feet to an inch. 1898.
514. Chart of the western coast of Peter the Great bay. Scale 4550 feet to an inch. 1898.
521. Chart from Peter the Great bay to the southern extremity of Korea. Scale 16·2 stat. miles to an inch. 1899.

Presented by the Chief Hydrographic Department, St. Petersburg.

PHOTOGRAPHS.

British East Africa and Mediterranean. **Molesworth.**

Fourteen Photographs of British East Africa, Cape Guardafui, and Stromboli, taken by Sir Guilford L. Molesworth. *Presented by Sir Guilford L. Molesworth.*

The following photographs, presented by Sir Guilford L. Molesworth, were taken by him on his expedition in East Africa, and during his voyage.

(1) Baobab, British East Africa; (2) Baobab, Mimbau; (3) Masai on the war-path; (4) Porters; (5) Wanika; (6) Wa-Kikuyu; (7) Wa-Kikuyu; (8) Wa-Kikuyu; (9) Wa-Kikuyu; (10) Lingonet volcano; (11) Lingonet; (12) Cape Guardafui; (13) Guardafui; (14) Guardafui; (15) Stromboli.

Central Africa. **Crawford**

Twelve Photographs of the Country in the Neighbourhood of Lake Mweru, Garenganze Country, by D. Crawford, Esq. *Presented by F. S. Arnot, Esq.*

This is a series of photographs taken by Mr. D. Crawford in the vicinity of the Lualaba river and Lake Mweru. The following is a list of their titles:—

(1) Looking north from "Holy Mount" down the Lualaba: (2) Lualaba river near Kalamata's; (3) Lualaba, looking south from an island; (4) Sphinx Mbuyu in Luba village; (5) Lualaba river at sunset; (6) View of Lualaba river; (7) "Holy Mount" where tribal deities are worshipped; (8) Looking down on village of Nyembo-kundu, Lualaba river; (9) In a Lake Mweru water-forest; (10) Lualaba river: (11) Looking down the Lualaba river from mountain-top; (12) Garenganze natives drawing copper wire.

North-West Frontier of India. **Tate.**

Sixteen Photographs of British Baluchistan and the Country in the Neighbourhood of the Railway to Kandahar, by G. P. Tate, Esq. *Presented by G. P. Tate, Esq.*

This is an exceptionally good set of photographs; the subjects are well chosen, and convey an excellent idea of the scenery of the country. The following are their titles:—

(1) View near the Koh-i-Malak, Siah; (2) The Matiki Gat hill; (3) View from near Camp Rabat with Lar Koh hills in distance; (4) The Kuh-i-Taftan; (5) Spur of the Rabat-Koh hill with camp; (6) Gorge at Amirchah; (7) Sandhills and rocks, Amirchah; (8) Kuh-i-Khwajah from eastern edge of Hamun-i-Helmand, Sistan; (9) Tutins, or reed boats on the Helmand Hamun, Sistan; (10) Luris, or Baluch gypsies; (11) Post at Dalbaudin, Quetta-Sistan trade route; (12) Ruins of Kahkah, on slope of Koh-i-Khwajah, Sistan; (13) Contorted strata rocks, Padagi hills; (14) Crater of Damodim looking towards the south; (15) Outpost at Marui, on the Quetta-Sistan trade route; (16) No title.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

The

Geographical Journal.

No. 4. OCTOBER, 1899. Vol. XIV.

EXPLORATIONS IN PATAGONIA.*

By Dr. FRANCISCO P. MORENO.

THE division of the continental waters takes place, without a doubt, between the river Belgrano and Lake Buenos Aires in the same conditions as further south, that is to say, in the Patagonian plateau or in its depressions. The present affluents of the southern part of the river Desire rise in the volcanic plateau itself, and run northwards to enter gorges covered by the lavas of the last eruption, that is to say, subsequent to the time in which the transverse depression was formed and eroded, and which unite the fjord of Lake Buenos Aires with the Atlantic. Arriving at this depression, they run through the centre towards the east, to lose themselves in small lagoons and large pools before gaining the Atlantic. The western plateau turns in this direction in the ordinary form of a raised headland, overlooking, on the south, the vast anterior bay of the lake, separated from the first mountains by the gorges by which the rivers Antiguos and Jeinemeni descend. More to the west the landscape assumes its fjord-like character. To the east, also, the plateau, on which craters can be seen, stops and opens in this direction, leaving a vast and lower expanse on which other more modern volcanoes rise, and which corresponds to the transverse depression formed prior to the eruption of these volcanoes, which protect with their lavas the smooth caps of Patagonian tertiary land. On the north side the table-land is free of lava, but capped by a considerable bed of shingle. What an enormous quantity of glacial detritus is found in this true *paysage morainique!* Certainly in no part of Patagonia are the moraines so well preserved. On every side enormous erratic boulders, quartzites,

* Continued from p. 269. Map, p. 352.

porphyries, and trachytes cap the undulations left by the moraines; and gneiss, for the first time, is seen amongst the detritus. In the flat cavities left by the retiring ice, small lagoons are seen, bordered by sand-banks; and springs, surrounded by rich pastures, abound. This ancient transverse depression has, to a great extent, been filled with volcanic ashes, which are visible in large layers, alternating with others of lacustrine and fluvial gravel.

Undoubtedly the transverse depression of Lake Buenos Aires is the largest in Patagonia. Since my visit in 1898, my fellow-worker, Mr. Waag, has succeeded in crossing the extremity of the lake and penetrating the river Las Heras which drains Lake Soler, into which Lake Buenos Aires flows. It is torrential and unnavigable. We thus have a further complete instance of the crossing of the Andean Cordillera by waters which rise to the east of it, taking advantage of the tectonic trenches, generally oblique to the axis of the main chain. All the transverse depressions of the Patagonian plateau correspond to large ancient fjords, the remains of veritable tectonic fractures, very probably produced by tertiary granite eruptions; and I think that the points at which the present rivers cut the chain are weak fractures which have been more easily and deeply eroded by the waters after the great masses of ice which covered and protected them had disappeared, and that this same melting process produced the wonderful erosions in the slopes of the Cordillera owing to the great quantity of resultant torrents. Lake Buenos Aires (985 feet) measures 75 miles in length from south-south-west to north-north-east, and is of similar type to the other large lakes mentioned—that is to say, partaking of the characteristics of both fjord and table-land lakes. In its extreme west it occupies a portion of the interior longitudinal depression which separates the main chain of the Cordillera from the isolated mountains. This depression stretches southward to Callen sound, and to the north it seems to extend a long way towards the eastern depression of the river Aysen, separating the cretaceous mounts Castillo and Ap Ywan (8625 feet) from the Cordillera proper. The west is overlooked by high snow-capped mountains, amongst them mount San Valentin (12,697 feet), with great glaciers. On the east the ancient outlet to the Atlantic is closed by modern volcanic ashes and fluvio-glacial detritus—first of all, those of the original moraine; and subsequently, those of the moraines left by the last extensions of the glaciers. In some parts of the western region the banks bear indisputable traces of the former level, and of its gradual and ever-increasing decline. These lines contribute to make the vast landscape, with its terraces and *roches moutonnées*, full of interest; and this is further increased by the picturesque calcareous islands, through which the waters have pierced their channels, converting them into so many *pots-à-arbre*. Springs, situated in beautiful prairies, are more abundant there than in the south, and it is certain

that within a short period the valleys lying between the eastern hills of the lake will be successfully made available for colonization. Last year I left a steam-launch there, by means of which the lake and its environs are now being carefully explored.

When delineating the aspect of the southern depression, and pointing out the present curious course of the Viscachas rivulet, I referred to the river Fenix. This river, rising in the Ap Ywan mountain, situated north of the centre of the lake, flows east-south-east for some 30 miles, and then abruptly turns to the west (1540 feet) to empty into Lake Buenos Aires. It runs between two lines of moraines marking the former extension of the last great glacier, which the lake subsequently occupied.

RIVER FENIX, NOW OVERFLOWING TO THE ATLANTIC AND PACIFIC OCEANS.

In consequence of one of the very common phenomena of capture to which these rivers are subject, the course of the Fenix has been turned towards the Pacific at one point from its ancient channel, and at such an insignificant level above low water, that, by working eight days with six men, we were enabled to send the waters back by their original channel to the Atlantic. This seems a practical demonstration of the fact that no mountains or hills existed there, and of the facility with which, by turning the waters in that direction, hundreds of miles could be easily colonized, which at present are regarded as useless deserts. If it was only when the ice melted in spring-time that the waters followed that course, to-day they have made it permanent. Lake Buenos Aires is merely a remnant of the enormous lacustrine deposit

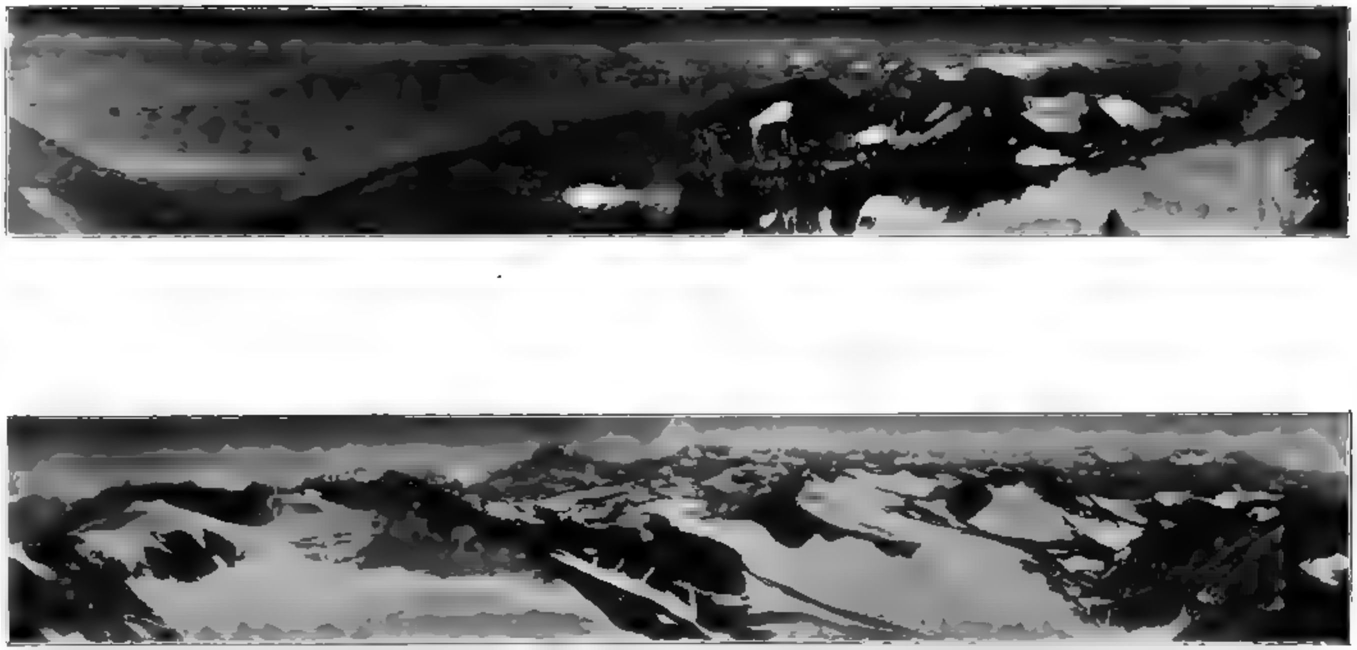
which existed in this region in pleistocene and even recent times, as the first Spanish explorers who penetrated into Patagonia in the neighbourhood of Port Desire found rivers there which have since nearly ceased to exist.

Between the depression of Lake Buenos Aires and that of the river Senguerr, which drains Lakes La Plata and Fontana (3050 feet) to the Atlantic, another lacustrine depression exists, the waters of which have been drained off in part by the present channel of the river Aysen when once the breach was opened in the central chain of the Cordillera. The wide and deep valleys of Huemules, Mayo, and of Coyet once belonged to it, and their drying-up is due to the same general causes already mentioned—the accumulation of glacial deposits, the decrease of waters through decrease of rains, and the increase of evaporation, as well as to the uplifting phenomena.

In 1888 I sent an expedition to study that region. At that time the Blanca lagoon, which was almost the sole remains of the lake in the valley of the Huemules, drained to the east into the Chalia rivulet, an affluent of the river Mayo. It has now ceased to flow in that direction, and, as the erosion is greater on the west, it is probable that the waters from its basin will in future run towards the southern affluent of the Aysen, and will be tributaries to the Pacific ocean.

In the river Mayo I have seen springs of the river Coyaike, the central affluent of the Aysen, rise in the same source as those of this river in the transverse depression, which is narrowed there by modern volcanic rocks; and identical phenomena are produced close to it in the Coyet depression, where it is impossible to distinguish the point at which the waters separate in the two directions in the great depression of this name, and in that of Cantaush. The shores of the great lake are perfectly visible there; they are the remains of a much larger one, which extended as far as the present basin of Lakes Musters and Colhue, in the neighbourhood of the Atlantic, and the probable outlet of which was in the present Gulf of St. George. This eastern basin of the present Aysen is bordered on the west by the central chain of the Cordillera which is formed of high granitic mountains with large glaciers which considerably add to the waters of the river Aysen. It is bordered on the north by the Jurassic and Cretaceous hills which enclose Lakes La Plata and Fontana on the south. In this depression there are beautiful workable lands, and really picturesque landscapes abound, with open woods situated in the midst of beautiful prairies.

Lakes La Plata and Fontana occupy a fjord of another ancient great eastern lake, and have their outlet in the river Senguerr, which fed the river Chico of Chubut—that is to say, the southern affluent of the river of this name. I say "fed," because its waters ran to this river up to 1892, but since then the outlet is probably subterranean, as, according to the Indians, the water of the river Senguer has not decreased during the past seven years.



CORDILLERA OF THE ANDES, NORTH-WEST AND WEST OF LAKE BUENOS AIRES.

Lakes Musters and Colhue are now without outlet, and are themselves the remains of a much larger one, likewise part of the great pleistocene lake the depression of which is seen to the south of the present ones. According to my data, a great depression exists in this direction, with saline lakes.

Lakes La Plata and Fontana are situated at a greater altitude than Lake Buenos Aires, this being a repetition of the case of Lake Belgrano with respect to Lakes St. Martin and Pueyrredon; they are surrounded on the north and south by hills composed of similar cretaceous rocks, containing similar fossils; while on the west they are bordered by the granites of the central chain, and moraines enclose them on the east. The Katterfeld mountain, situated on its southern shore (5900 feet), is covered on its summit with glacial gravel. In the north the hills advance more to the east than in the south, and are composed, in the neighbourhood of the plain, of volcanic rocks, which at times cover cretaceous schists, and enclose beautiful valleys. We have discovered there numerous cretaceous fossils, both animals and plants, and coal has been observed.

The plain extends between these hills and the central ridges of Patagonia, at the base of which the river Genua flows towards the south to join with the Senguerr. These chains are composed partly of tertiary granite and porphyritic rocks, and partly of beds of upper cretaceous, probably containing saurian and mammal remains. This plain also forms part of a great lost lake which extended to Mounts Appeleg, Omkell, and Cherque, cut by the narrows through which, in ancient times, another lake drained, now also lost. It was situated between the hills to the north of Lake Fontana and the Putrachoique hills, in which depression, at the present time, the continental waters divide themselves amidst perfect morainic landscapes. This country is very suitable for colonization. While the waters which flow eastward empty, *viâ* the affluents of the river Genua, into the Senguerr, those to the west cut the Cordillera with the rivers Frias and Cisne, which empty into the Payuhuapi inlet on the Pacific coast, and with the river Pico, which feeds Lake Rosselot, which seems to occupy the continuation of the Payuhuapi depression, and drains into the river Palena, forming its principal southern affluent. The landscape seen from the highest point of the moraines (3600 feet) in the centre of the depression is interesting. To the east the mountains of Genua, rounded by the ice, which mountains are prolongations of the Sierras de Tecka, corresponding to a chain in the centre of Patagonia; while far to the west, only visible when the horizon is clear, the snow-capped crests of the Cordillera are seen; and yet nearer are the undulating forest-covered hills. A great number of terraces, forming depressions with fertile valleys, are indications of so many distinct levels; first of the waters of the primitive lake, then of the secondary

PENINSULA SAN TADEO, AT LAKE NAHUEL-HUAPI.

lakes, and finally of the rivers which have disappeared, and which are now converted into streamlets, hidden for the most part amongst woods and tall grass, which impede the traveller. Gravel detritus, presenting all the characteristic forms of its origin, covers the ground, the huge erratic boulders showing the great height attained by the ice and the waters of the lost lake.

Crossing the hills uplifted by modern volcanoes, the materials of which were ejected through the weak places produced by eruptions of tertiary granite which is seen in round patches on the sides of the present eastern valley of the river Carren-leufu, we reach this valley along which the central affluent to the river Palena flows. This affluent rises in Lake General Paz, which is similar in structure to the others (2820 feet), and the waters of which are confined on the east by the ancient basal moraine, and by the moraines of the later extension visible in vast semicircles. My assistants are now examining the interior of the lake with its various fjords, into which glaciers descend, and which are surrounded on the south-east by tertiary granitic hills, polished as whale-backs by ice, and by cretaceous schists and more ancient eruptive rocks on the west. The river Carren-leufu, after following at the outlet of the lake an east-north-east direction, turns to the north, and then to the north-west with a pretty wooded valley, to cross, in an east-west route, the main Andean chain, and empty, through the river Palena, the river Claro originating in Lake Rosselot, and the river Frio, an important affluent which flows from the north in a longitudinal depression close to the Pacific. This depression corresponds to that of Lake Rosselot, a depression which separates two high ridges of the snowy Cordillera culminating in Mounts Maldonaldo, Serrano, and Blanco on the eastern, and Melimoyu (8650 feet), Corcovado (7450 feet), and Yanteles (6725 feet) on the western. The river occupies, in its eastern third, the same longitudinal depression which extends from the south, separating the mountains from the terraces; the rims of the Patagonian terraces are seen on the east, and cretaceous and modern eruptive rocks on the west, while the valley is filled with glacial detritus. If this depression is followed towards the north, separated by a remnant of moraine, the beautiful valley of "16 de Octubre" is reached, the present location of a prosperous Argentine colony. This valley is only the bed of another dried-up lake, the remains, in its turn, of another much larger one, the lines of level of which can be easily distinguished on the slopes of the neighbouring hills. It is to-day sinking in the morainic terraces; its waters once flowed, at least those of its last depression, into the river Fta-leufu, which has been lately recognized to be the same as the river Yelcho, that drains to the south of the Reñihue inlet into the Pacific. To the north-east of the Carren-leufu plateau there are certain eruptive and volcanic rocks which

have broken up the ground, forming the high hills of the west of the present river Tecka, and which is surrounded on the east by the longitudinal depression which precedes the first ridges of the Cordillera. The Corintos rivulet rises in these hills, and has the reputation—though this is not thoroughly established—of possessing auriferous deposits, the upper lacustrine basin of which is the most appropriate for the study of the terrace-levels. I have counted twelve perfectly defined steps there. Before the opening of the Carren-leufu and Fta-leufu narrows, this basin was connected with the Atlantic on the east, draining through the river Tecka, on the shores of which perfectly distinct traces of level are seen. At the present time, at the bottom of the ancient channel

LAKE VIDAL GORMAZ, FORMED BY ALLUVIAL FANS IN THE SOUTH-WESTERN ARM OF LAKE NAHUEL-HUAPI.

of the outlet, waters rise which flow to both oceans, separated in the Zunicaparia swamp by a ledge of shingle not more than 30 feet higher than the present streamlets.

I have said that the river Fta-leufu at present receives the waters of the valley of "16 de Octubre" (1085 feet). It also receives those of a vast northern area now bordered by moraines separating the waters which empty into Lake Cholila (1705 feet) from those flowing to Lake Puelo (560 feet), which, in its turn, flows through the river of the same name into the inlet of Reloncavi on the western coast of the continent. This opening, which separates Situation mountain (6690 feet) ridge immediately to the west of the valley of October 16 from the lateral chains of the Cordillera proper, contains a series of

beautiful lakes, the principal ones being Ftalauquen (1560 feet), Menendez (1590 feet), Rivadavia (1640 feet), and Cholila, which are chiefly fed by waters from the glaciers of the central chain, called the secondary chain by some Chilian geographers, and on the western slope of which various important rivers, tributaries of the Pacific, rise, such as the Corcovado, the Reñihue, the Bodadahue, etc. That chain, which I consider as the main chain of the Cordillera, extends from Fontana lake to the north, and joins the one which is overlooked by the beautiful Mount Tronador on the west of Lake Nahuel-Huapi, being cut by the rivers Cisne, Palena, Yelcho or F'ta-leufu, Puelo, and its affluent the river Manso. The lakes named, supplying waters to the river Fta-leufu, are the remains of fjord-like arms of the great lake which, in other times, existed between the main chain of the Andes and the mountains of the centre of Patagonia, situated on the east of the river Tecka. These lakes were once covered by an extensive glacier, judging by the enormous erratic boulders, hundreds of cubic yards in size, which I saw deposited on the volcanic hills of the Apichig gorge, at an altitude of 650 feet above the present plain, and in the neighbourhood of which is the northern boundary of the lost lake. Before disappearing, this lake was divided into various fractions, separated to-day by glacial deposits; and in its depressions another secondary parting of the waters of the continent was formed. In the plain of Cholila, the northern affluent of the Chubut flows on the east; and the waters rise there which empty into the basin of the river Puelo, tributary of the Pacific; while springs from the same moraine reach, through the southern lakes, to the river Fta-leufu, also tributary to the Pacific.

To the north of this depression, and separated by Epuyen lateral ridge, cut in its turn by the waters of the lake of the same name, another one, in which Lake Puelo occurs, is situated, which formerly extended to the vicinity of the southern fjords of Nahuel-Huapi, but is now divided into two parts. The waters of the southern one emptying into Lake Puelo, to quit it in the turbulent river flowing to the Pacific by the narrow gorges of the main chain of the Cordillera, while the northern one feeds the affluents of the river Manso, which also traverses the main chain to flow to the river Puelo.

I have pointed out that the ancient lake of the depression of the valley "16 de Octubre" emptied in a previous epoch into the Atlantic *viâ* the river Tecka, now an affluent of the Chubut. To the north of the ancient channel stretch a series of hills separating a secondary longitudinal valley, situated on the east of the Esguel and Lilig hills, which was also the bed of the same lake; this is easily recognized by the strata which are observed in the cuttings of the streams that at present cross it transversely. This depression extends northward to unite with that of the northern arm of the Chubut, and is separated

from the latter by an extensive moraine reclining on a volcanic hill. The northern arm of the Chubut penetrates through the continuation of the longitudinal depression, also crossed by deep transverse gorges, outlets of the different levels of the ancient lake as it shrank its proportions. It extends to the north until it reaches the high plateau which separates the depression of the river Chubut from that which corresponds to the river Limay; and, likewise, another transversal valley, in which at a previous epoch existed the river carrying the waters of the Nahuel-Huapi to the Atlantic by the present San Antonio bay. This plateau, also formed by different terraces, and covered with the remains of the glacial period as far as the western

MOUNT TRONADOR, IN THE MAIN CHAIN OF THE CORDILLERA.

hills, overlooks the entire eastern depression of the river Manso, which separates it from the lateral ridges that precede the veritable Cordillera, and various springs rise in it—some affluents of the Chubut, and others of the basin of the Nahuel-Huapi lake. It has, on its western edge, a chain of cretaceous hills, which in some parts attain an altitude of 7000 feet, with peaks consisting of a porphyritic rock, which, mingled with the dark grey of the schists and the green of the trees of the surrounding forests, gives a vivid colouring to the mountain.

The descent from the plateaus to the plain of the ancient extension of Lake Nahuel-Huapi is rather long, and on its sides erratic rocks abound, which are not generally found at the bottom of the depression,

except in the deposits that correspond to the second advance of the glacier, the last moraine of which surrounds the present lake, which undoubtedly is the most beautiful in Patagonia. If the present extension of the lake is great, and its western channels penetrate to the heart of the Cordillera, this extension was, in a relatively recent period, much greater. The series of small lakes I have referred to, which now empty into the river Manso, are remains of arms of Lake Nahuel-Huapi. The waters of this extended, in recent times, to the present Limay narrows on the north, and washed the base of the Cordillera nearly to Lake Traful; in the south they filled the fjords where Lakes Vidal Gormaz (2330 feet), Guillelmo, Mascardi (2570 feet), Gutierrez (2575 feet) and others smaller, are found to-day; and on the east they filled all the depression of the present valley, discharging, not as at present through the recent gorge through which the Limay flows, but through the still existing transverse depression that terminates at the end of St. Matias gulf, called the Bay of San Antonio. The eroded terraces and the erratic boulders which I have mentioned as being on the slope of the plateau indicate that extension. At present the waters are diminishing, either through erosion having produced greater drainage outlets, decrease of rains, or evaporation, so that the lake has been divided; but in its extreme north-west its remains are seen in the beautiful Lakes Espejo and Correntoso, which occupy the longitudinal fjord peculiar to all the great Andean lakes already named, and separated from the present Nahuel-Huapi by small alluvial cones; on the extreme west similar lakes are seen in another ancient fjord. In the south-west, Lake Gutierrez, situated at an altitude of about 150 feet above the present Nahuel-Huapi (2430 feet), primarily formed by the terminal moraine of the glacier of the fjord, is only separated by a cone of sediment 50 feet high from Lake Mascardi, likewise the remains of the same fjord. While the first discharges into the same lake, the second has its outlet to the west and south after receiving the waters of Lake Vidal Gormaz, through a very recent deep gorge, produced, probably, in part by volcanic phenomena, until it encounters the eastern valley of the river Manso. The ancient fjord south of Lake Nahuel-Huapi previously penetrated slightly more to the west than the present arm of Port Blest in the same central chain, at the southern base of Mount Tronador, which chain extends to the south, separating the waters that fall into Lake Gormaz from those forming the river Cochamo, which discharges directly into Reloncavi inlet. Mount Tronador, the king of this part of the Cordillera (10,860 feet), distributes the waters of its glaciers to Lake Nahuel-Huapi and Todos los Santos, its western congener. The river Limay is now the outlet of Lake Nahuel-Huapi, its course having pierced an outlet into the ancient valley of the lake, and joined the ancient river which collects also the waters of the northern longitudinal depression in part. The rivers Caleufu and

Chimehuin are affluents to the river Collon Curá, which carries to the Limay all the waters of the eastern Andean slope from parallel 37° 30′ through the continuation of the general eastern depression. The character of the region is generally the same as in the south. Lake Traful, which discharges into the Limay by the river of this name, occupies one of the many transverse fjords already mentioned. It is deep, like all the Andean lakes, and very beautiful with its picturesque granitic and volcanic mountain groves and wooded islets, overlooked on the west by the central chain, and on the east by the terminal moraines of the ancient glacier.

VOLCANIC TUFF AT RIVER LIMAY.

The river Caleufu carries the waters of the lakes Villarino, Falkner, Filohuehuen, Hermoso, and Metiquina to the Collon Cura; while the river Chimehuin no longer receives all those of the east Andean slope. In relatively modern times, between the Sierras de Chapelco and de la Virgen, a great lake existed, the present remains of which are Lake Huechulafquen (2820 feet), in which the beautiful cone of the Volcan Lanin (12,140 feet) is reflected, and the lakes Lolog and Lacar. To-day only the two first named discharge into the Atlantic; the third, which emptied on the east into three rivers, the beds of which are perfectly preserved, is, on the contrary, a tributary of the Pacific, its waters turning into the river Huahuma, which has cut through the main Andean chain, which is there called the Cordillera de Ipela (7500 feet). An altitude of scarcely more than 5 to 10 feet at the base of a moraine

separates the waters of the river Quilquihue, the outlet of Lake Lolog (2920 feet), from those of the Calfuco stream, affluent of Lake Lacar (2200 feet); and at that point, at the base of the remains of the plateau, a spring exists, which sends water to the two streams.

The valley of the Chimehuin is already the seat of a prosperous township, Junin de los Andes (2560 feet), which will become the emporium of the riches of those regions so soon as a sufficient population arrives to exploit them, and the trans-continental railway is constructed on the route indicated by Captain Fitz Roy in 1834 as being the easiest means of communication between the Atlantic and the Pacific, which is that of Puerto San Antonio, on the Bay of St. Matias.

The region in the neighbourhood of Junin de los Andes, watered by the rivers Chimehuin and Malleco, is one of those which has the best future before it in the Neuquen territory, in Northern Patagonia. It possesses extensive pasture lands, the Araucaria forests beautify its landscapes with their fantastic foliage, and strawberries abound in the proper season, amongst the apples introduced in very early times. On the west, projecting over the lower mountains, are still active volcanoes, such as the Lanin (12,140 feet), whose glaciers diminish from year to year; the Quetrupillan (9185 feet), with its truncated cone; and the Villarica (9675 feet), picturesque in its forest groves. As one advances northward, after passing the high primitive plateau of Pichi-Nahuel Huapi, one finds verdant valleys with charming lakes, gorges cut through the granitic rock, capped with lava, offering a most beautiful and varied prospect—the green prairies alternating with the forests. The river Alumine receives the waters of these lakes, as well as of the torrents and those of the picturesque lake of the same name, which penetrates to the heart of the Cordillera, and is surrounded by characteristic moraines; while on the east abrupt fields of lava are in the Catalin ridge—an independent mountain, which forms no part of the Andean Cordillera. The northern affluents of the Aluminé are separated from those which form the river Bio-Bio by a tall moraine (4580 feet) of the ancient lake which occupied the eastern depression of the Bio-Bio when its waters ran into the Atlantic, before the opening of the cañon through which it now empties into the Pacific. It is a region of great interest, from various aspects, about which, however, I must not say more now, as it would be foreign to the object of this lecture.

To conclude this lecture, the extent of which prevents me going more fully into details, I think it advisable to give the following summary:—

Starting from the Atlantic coast, we find in Patagonia a denuded tertiary and sometimes cretaceous table-land extending from the Rio Negro to Magellan Straits, interrupted in its geological uniformity

by the ancient eruptive rocks and archean schists of San Antonio, Point Atlas, Santa Helena, and Port Desire, which are the effects of analogous formations from further inland, and constitute the almost obliterated central chain of Patagonia, the remains of which are Mounts Calgadept, Talaguepa, and Los Martires, and those near Lake Musters. This plateau is cut by large transverse depressions, the principal being the Hualichu depression on the south of the Rio Negro, the Maquinchau and Balcheta, through which previously emptied the waters of Lake Nahuel-Huapi, the present Chubut, Senguerr, Chico, Desire—ancient outlet of Lake Buenos Aires—to-day nearly exhausted,—the

VOLCANO LANIN, FROM THE VALLEY OF THE MALLECO.

analogous river Gio, which is between the Desire and the totally disappeared river San Julian, which has connected probably Lake Belgrano, by the river Chico, with the Atlantic; the depressions of Lakes San Martin and Viedma, the river Shehuen, the Santa Cruz, the Coile, and the Gallegos.

Besides these transverse depressions, which are now, or were, occupied by large rivers, other depressions are found in the plateau, which were occupied by more or less extensive lakes, having their outlet through these transverse valleys, such as the Yagagtoo, Musters, and Colhue, and others situated on the south of Port Desire, in the centre of the country.

These plateaus are covered, on the greater part of their surface, by a cap of loose glacial, and in some parts by fluvio-glacial, gravel, which

barely supports the growth of some coarse pasturage and a few bushes on the shores of the northern rivers. At the present time, good pastures are only found on the watered lowlands, where bushes are more numerous, but, by irrigation, extensive lands can be cultivated in the whole of the country. In the central region, volcanic eruptions, which have taken part in the formation of the plateau, from the tertiary periods down to the present era, cover an important part of it with basaltic lava-caps; and in the western third recent glacial deposits appear even above the lavas. The plateau terminates at the base of the first lateral hills preceding the Cordillera of the Andes.

There, in contact with folded cretaceous rocks raised by the tertiary granite, erosion, produced principally by the sudden melting and retreat of the ice, aided by tectonic phenomena, has scooped out a deep longitudinal depression, which generally separates the plateau from the first lofty hills, while on the west of these—which generally form small ridges or isolated hills—a similar longitudinal depression is observed which precedes the veritable Andean Cordillera. This depression contains the best and most fertile lands of Patagonia. The geological constitution of the ground is in accordance with the orographic physiognomy. The tertiary plateau, horizontal on the east, gradually rising on the west, shows upper cretaceous caps at its base. The first lower cretaceous hills, raised by granitic and dioritic rocks, probably tertiary, and then, on the west, metamorphic schists of uncertain age; then quartzites appear, resting directly on the primitive granite and on the gneiss which form the axis of the Cordillera; while porphyritic rocks are seen between the schists and quartzites. All these rocks are covered with the remains of the ice-period, which are not only observed in Patagonia, but also in the whole western region of the Argentine Republic. I have seen moraines and glacial lakes on the Puna de Atacama, and on the mountains in the province of Salta as far as parallel 23°, and I have found perfectly characteristic ones in the provinces of Catamarca, Rioja, San Juan, and Mendoza. There the glaciers have descended to the level of the present plain (2400 feet). The glaciers occupy the valleys of the main chain and some of the lateral ones of the Cordillera. Many, on the west, descend to the sea to lat. 44° 30′, and, on the east, to the lakes, strewing them with icebergs; while several of the high peaks are still active volcanoes, among which I should mention three little known—one situated to the west of Lake Dickson, according to the Indians; another, the Fitzroy volcano; and the third was seen from the Argentine vessel *Azopardo* from the sea, in about lat. 47° 30′.

In Patagonia an immense ice-sheet extended to the present Atlantic coast, and further east, during the first ice-period; while, during the second, terminal moraines have been generally left as far as 30 miles north and 50 miles south to the east of the present crest of the Cordillera. These ice-sheets, which scooped out the greater part of

the longitudinal depressions, and appear to have rapidly retreated to the point where the glaciers now exist, did not succeed in filling with their detritus, in their rapid retirement, the Cordilleran fjords now occupied by deep lakes on the east and by the Pacific channels on the west. Soundings taken in these channels (which have reached 250 fathoms in some fjords) show that the depth of these fjords is greater in the vicinity of the mountains than to the west of the islands; and probably a longitudinal depression exists there analogous to the one which preceded the plateau on the east, and limited by a submarine plateau to the west.

It is evident to me that we have in Patagonia a portion of the Antarctic continent, the permanency of which, in so far as its main characteristics are concerned, dates from very recent times. When, lately, I went through the western, *i.e.* the Pacific channels, my attention was directed to the islets in close proximity to Chiloe—between that large island and the Cordillera—they appeared to me to be of very recent emersion, and I recalled Darwin's interesting observation, when he noticed that, in Chiloe, various promontories, joined by extensive beaches to the mainland of the island, are called "huapi," the Araucanian equivalent for "islands," thus perpetuating, perhaps, the recollection of the time when they were islands. Those of the islands I was able to see were composed of caps of shingle, with great, more or less rounded, boulders, of sand and volcanic ashes, essentially of the same form as some of the remains of the Patagonian plateau.

To those who have studied the pampean formation, it is well known that the actual land of the Buenos Aires province must have extended eastward in recent times, and that the advance of the sea, and the salt-water deposits left by it when it retired, forming some of the lowlands which are seen on the littoral and even in the interior of the pampas, are much more recent. Likewise certain caps of shingle derived from rocks of a different class to those of the neighbouring hills, which are observed on the Atlantic coasts of the same province, increasing in quantity and size as one advances southwards, seem to indicate that the caps of shingle which now cover a great part of the Patagonian territory extended more to the east on emerged land which has now disappeared; while other marine deposits seen on the same coast appear to have been turned into bays during the subsequent advances of the sea. Besides, in the neighbourhood of the present coast, even in the very province, deposits of volcanic ashes are found; and the ocean deposits on its shores blocks of basaltic lava, which probably proceed from eruptions of volcanoes now under the sea, similar to those to which I have referred in Patagonia. But one of the facts which seems to me to demonstrate with greater certainty the existence, in recent times, of land now lost is the presence of the remains of the pampean mammals in pleistocene deposits in the bay of San Julian, discovered by Charles Darwin, and

in Santa Cruz, where I have myself gathered them. These animals lived there in the intermediate period between the great ice extension of the Patagonian inland ice and the second period, and, undoubtedly, reached that point from the east, as it is not presumable that they advanced from the north to the south over the plateau cut by the great (now lost) rivers, all of which contained ice in abundance. The presence of extinct animal remains in Patagonia in the vicinity of the Cordillera, demonstrated by the discovery of the skin of the so-called *neo-mylodon* in the cave near Last Hope inlet, to which reference has already been made. may be explained, I think, by supposing that the animal to which this piece of skin belonged penetrated from the east to the neighbourhood of the Cordillera in the intermediate period between the two glacial extensions, the piece of skin being preserved till now, owing to the favourable nature of its surroundings.

So, then, the history of the Patagonian plateau is connected with the problem of the southern continent, which, to so great an extent, has disappeared. The discovery in its geological caps of vertebrates closely allied to others found in South Africa, and Australia; the large fossilized tortoises of the province of Buenos Aires, analogous to those found in the islands of the Indian ocean and in the Galapagos; the discovery of dicotyledonous plants in the Andean cretaceous formations, among others, apparently, remains of the eucalyptus—are all in favour of those who maintain the existence of those lands and their disappearance in recent times. It is known that the Patagonian tertiary formations—abounding in mammalian remains—are, in their major part, lacustrine deposits, formed of sand, caps of gravel, and volcanic ashes; but the great lakes which these deposits formed were extended to the east, as is demonstrated by the cliffs of the Atlantic coast, and as these deposits occupy the greater part of the present Patagonian territory, it may readily be admitted that when those animals lived, the continent had a very much greater extension in that direction.

The whole of this vast region of Patagonia is very thinly peopled; even the Indians, never very numerous, are dying out, and colonization has not progressed as it should have done, seeing that land exists there which would support a considerable number of human beings. However, in the neighbourhood of the river Gallegos, numerous cattle farms have been established, and the cattle are developing admirably; Gallegos city consequently prospers. Also in Santa-Cruz the village grows rapidly. To the north of the river Chubut valley, where, in 1865, the Argentine Government formed a colony with Welsh settlers, the soil has been fully developed, the finest wheat of the Argentine Republic being grown there. Another colony is situated in the valley "16 de Octubre" near the Cordillera; while in other parts of the territory, cattle estates are met with, which are being successfully developed, principally in the neighbourhood of the Gulf of Saint George. The Argentine

Government has now turned its attention to the southern lands of the Republic. All danger of international complications having disappeared, the first step of the Government was to exchange contracts for war material, amounting to over a million pounds sterling, into contracts for railway material for immediate use in the construction of the projected line of railway between the Atlantic and the Andes, starting from the port of San Antonio, which was considered by Captain Fitzroy, early in 1834, as the best route for communication with Chile; while surveys for irrigation works are being made at this moment, and plans for irrigation are now being elaborated which, when completed, will easily change the desert aspect of a large portion of Patagonia.

WOOD OF ARAUCARIA IMBRICATA.

And it is very satisfactory to learn that on June 1 the great southern line will be opened as far as the junction of the Limay and Neuquen rivers with the Negro river on its way to Nahuel-Huapi, the most lovely lake in South America. Here and there the traveller finds a Tehuelchian or Gennaken encampment, but natives of pure race are now very scarce; it would be difficult to gather together fifty true Tehuelches, and the number of Gennakens cannot be much greater. The remaining native population is composed of the ancient Araucanian race, or a mixture of the three races. But these do not represent the only type of human beings which have dwelt in Patagonia. In ancient burial-places I have collected the remains of other—now totally disappeared—races, which were quite distinct from the present ones, but which greatly resembled the primitive types met with more to the north,

in the Chaco and in Brazil, while others strongly resemble some Pacific races, possessing ethnic characteristics which have not been observed in South America. Among these remains, every type of artificial deformity of the skull hitherto known is found; while to-day the natives only preserve the occipital deformation. This variety of extinct human types should of itself form the subject of a serious investigation. Patagonia is the extremity of the American continent, and has been the last refuge of more than one people in their forced exodus. For the purpose of study, I have handed to the staff of the British Museum, duplicates of the extinct and present animal remains of Patagonia, and of its flora, which I collected in my excursions, as well as of those obtained by the *personnel* of the La Plata Museum, of which I am the director; and I trust that, with such competent collaboration, it will soon be easy to give an exact idea of Patagonian biology, of which I must not treat at this meeting.

The physiographical facts which I have sketched in broad outline show how interesting the lands of Patagonia are to the geographer, the geologist, the zoologist, and the botanist.

I do not think I shall be accused of exaggeration when I say that the study of the extremity of South America, where Charles Darwin received the first impressions of his grand ideas, and which, nevertheless, has since been so neglected by English scientific men, is, among the less-known regions of the Earth, one of those which should awaken the greatest interest. The Argentine Republic, owning the chief part of this territory, as a new country, does not yet possess a sufficient number of persons for carrying out the investigations I have alluded to, and would welcome those who might go there for the purpose of such studies. I have no doubt that both the people and the Government would efficaciously co-operate to make their visit a success. The climate is healthy; there are no great difficulties in travelling in the country, even in its most unknown regions, and, with that perseverance which is inseparable from true knowledge, the results which would be obtained would be extraordinary. So I take the liberty of proposing that our Society, with the co-operation of the British Museum, the Royal Society, and other institutions which take interest in this class of studies, should procure the means of realizing these investigations. It is to be desired that, at the time at which the Antarctic Expedition takes place, a complimentary one should be despatched to the Argentine Republic with the object of studying its territory, seeing that it cannot be extraneous to that of the antarctic regions; for already many persons think that these regions are the remains of an extensive continent which, in more or less distant periods, included, among others, a part of the Argentine territory. Perhaps a brief statement of some of the points to be investigated would show how great the need was for it.

A great part of the extension of the Andean Cordillera is completely

unknown, both as to its topography and its geology, and yet its study is of the utmost importance, in view of the problems, the solution of which depends upon it. It is not hazardous to say that the ideas current with reference to its formation and constitution do not correspond with the facts, and I will say the same as to other mountainous regions of my country. Very few countries are more appropriate for the study of vulcanism and the movements of the Earth's crust, the activity of which now causes constant tremblings, which are felt up to the eastern regions of Bolivia, producing tectonic phenomena requiring immediate study.

The formations of the plains of Argentina, of its renowned Pampa, and of the Patagonian table-lands, are problems still waiting solution, and claim the direct attention of experienced observers, as well as an investigation into the origin and development of the animals and plants —principally of Patagonia—the fossil remains of which have so greatly interested palæontologists, who anticipate that they will fill up many of the great gaps existing in the knowledge of the vital evolution in the Earth.

Much new material for zoologists and botanists would result from the exploration of the mountains and woods in the north of the Republic, and of those of Patagonia and its coasts; the fauna of the Andean lakes is still a mystery.

Physiography has much to gain from the study of the process of the formation of the present features of this part of the Earth; it would be difficult to find another country where the action of the ice could be so easily studied, as well as the phenomena of erosion and denudation.

Those who are engaged in the study of the past history of mankind, would find an ample harvest of new data—many of them unforeseen—which would open out vast horizons, by exploring the vestiges of lost or nearly extinct races—some half civilized, others nomadic, which can still be found in the Atacama high lands down to the end of the continent.

And, finally, those who desire to investigate with that personal knowledge of the ground which so greatly strengthens one's convictions, the economic value of the physical conditions of that territory, will receive compensation for their labours in being able to say that human energy possesses there a vast fertile field for its exercise.

Science would gain much from this class of investigation; industry and commerce would profit thereby; and—why should I not say it?—my country also, which is to-day engaged in effacing the errors of the past, would gain in every way, when once unbiassed men, accustomed to observation, give expression to their opinions as to the nature of its soil, and as to what it might be expected to sustain if properly exploited. It seems to me that investigations carried out in this way would have a practical result in every sense of the word.

Before the reading of the paper, the PRESIDENT said: This evening we are to hear a most interesting paper from Don Francisco Moreno, the great South American geographer and geologist. About two years ago I wrote a paper for a magazine in America, on the subject of the countries which have not yet been discovered, and I put a long black mark along the eastern side of the Patagonian Cordillera. That black mark has now to be removed. Don Francisco Moreno has since brought the news to us of his important discoveries in that region; he has also brought a great number of maps and most beautiful photographs of the country explored, and he has communicated to us a very full and very valuable paper, which will be printed in our *Journal*. This evening we can only have a brief abstract of that paper, and Señor Moreno will show us a number of his photographs.

After the reading of the paper, the following discussion took place:—

DON FLORENCIO L. DOMINGUEZ, Minister of the Argentine Republic: I thank you most heartily for the kind words in which you have introduced the name of my country, and for the cordial reception given to Señor Moreno. The Royal Geographical Society, which has so many titles to the consideration of the learned men of the whole world, is looked upon in the Argentine Republic with genuine sympathy for the interest it has always shown in the investigation of the features of a country which offers so many natural attractions to the traveller and such a wide field for scientific investigations. The learned President has shown in his works a thorough knowledge of the South American continent and true sympathy for the efforts of their sons in developing and making known the vast resources of their own countries. As to my own country, this is not the first time that he has spoken kind words. It has been my pleasure to listen to him in similar circumstances as those that have gathered us here to-night, when a fellow-countryman of mine, an officer of our navy, gave an account of his travels in the wild regions of the Rio Bermejo; and not long ago, only last year, in welcoming an English traveller after his gallant attempt to climb Aconcagua, he spoke in eloquent words of General San Martin's memorable achievements in crossing the Andes with an Argentine army in order to complete the liberation of two sister republics. Sir Clements has followed with kind interest the explorations of our own travellers, the works of our writers, and his opinions are the result of his deeply rooted convictions.

The Argentine Republic, as a whole, is not unknown in Great Britain. Our commerce is of great importance; we receive from the United Kingdom far more merchandise and products of the industry of her people than from any other country, and in exchange Argentina sends to this hospitable land the natural products of her soil and of her camps, which contribute in some extent to the well-being and comfort of the sons of this great empire. There are in the museums and other institutions of this country many objects which show the Argentine Republic under a scientific aspect. but there are, however, portions of the country which contain, perhaps, unravelled features and secrets worthy of investigation by those whose aim is the expansion of human knowledge. We have always welcomed those men, and it is our invariable rule not only to keep an open door, but to give free access to our territories to all those who, seeking a high ideal, come to our shores in search of new elements. to irradiate after the light they have gathered. The name of Darwin, not to mention any other, will always be fresh in the memory of the Argentines.

DR. WOODWARD: I can only testify to the great advantage which the British Museum has derived from Dr. Moreno's generous assistance, in presenting to the natural history branch of our museum numerous objects from Patagonia and from the Argentine Republic generally. As you are aware, sir, he is the Director of the

great museum at La Plata, and those who have visited that museum can testify to the splendid work he has carried on there, in addition to the enormous labours, which you can judge by the character of his paper to-night, he has expended on this vast region of Patagonia.

From the geological point of view, no doubt there is no country that has been under exploration of late years offering so grand an opportunity to the geologist and geographer; the lakes, plateaus, and river systems must afford enormous fields for investigation in pure geological work. But more interesting to us, who are connected with the museum, are the wonderful Tertiary and Cretaceous deposits, containing such a remarkable fauna of both mammals and birds. This region was touched upon so long ago as the forties by Charles Darwin, and visited at various points by Admiral Fitzroy. Since that time very little exploration has gone on until now; we have laid open all at once a region rich in a new mammalian fauna, which will probably result in an extraordinary extension of our views as regards the geographical distribution, in Tertiary times, of the mammalia of the Southern Hemisphere. That we find in a region like Patagonia evidence of mammals which have their relations in Australia seems an extraordinary thing; but it is not improbable that some marsupials, which have been discovered in these Tertiary deposits of South America, may be related by descent with those of Australia, and therefore, in connection with what Dr. Moreno has said in regard to the importance of Antarctic exploration, it is quite justifiable to add the exploration of this region to that of the Antarctic; because it is possible, and strongly believed by many naturalists, that there may have been a former connection between these lands and the antarctic continent and the lands on the other side of the hemisphere.

With regard to Dr. Moreno's work in connection with geology, I have said sufficient to point out the great obligation we are under to him in making known and bringing examples of these various forms of animals to our museum. We have had visits paid to the La Plata museum by Mr. Lyddeker, Mr. Arthur Smith, Mr. Woodward, Mr. Oldfield Thomas, and others, and I hope we may look forward to closer inter-relationship between the Argentine Republic and this country, which will be of the greatest service in the promotion of natural science generally.

Dr. Gregory: I have had the pleasure of reading the paper, and therefore have much pleasure in joining in your tribute to its great importance to Patagonian geography. At this hour of the night it is not possible even to refer to all the points upon which it throws light. I might perhaps mention three.

First, the probable connection of Patagonia with the antarctic continent, which renders it necessary that its natural history should be worked out before the collections from the antarctic expedition are brought home; as otherwise it will not be possible to get great results from these collections.

Second, there is the question of the relations of the fauna and flora of Patagonia with those of Australia and the Cape.

Third, there is that remarkable instability in the geographical structure of Patagonia which seems to have caused great geographical changes in recent times.

As I heard the paper I could not help being reminded of the passage in Charles Darwin's book on Patagonia, in which he said it seemed as improbable that any country could have kept unchanged in position throughout a whole geological period as that the atmosphere could have kept absolutely calm throughout a whole season. That probably seemed a sensational exaggeration, but when we read the evidence brought forward by Señor Moreno, and the great geographical changes that have so recently occurred, that remark seems justified. I can only hope that the invitation Dr. Moreno has given will be taken up, and several typical areas in

the country deliberately worked out by some expedition, sent out on a scale commensurate with the important work.

Colonel CHURCH: Many explorers have given us scraps of geographical information regarding Patagonia, and sharpened our appetites for more knowledge of that *terra incognita.* Since our childhood, we have allowed our fancy to play with its mysteries, and have longed for some bold explorer to thoroughly penetrate them. The world has scarcely known that, quietly, but intelligently and indefatigably, a great Argentine traveller and *savant* was busily engaged in gathering for us what we so longed to possess; and therefore we give no ordinary welcome this evening to Dr. Moreno, who lays before us the geographical treasures which he has accumulated, the rich fruits of many years of wanderings and careful studies in the interior of that, thanks to him, no longer unknown land.

I have seen much of the coast-line of Patagonia, but have never penetrated its interior. Some of the fjords and islands among which I have voyaged, on its west coast, are marvellously beautiful. In all of the gorges of the low mountains, glaciers pour from beneath them streams of water from such an elevation that they break into mists before striking the ocean, and are spanned by rainbows.

The line of coast from the island of Chiloe to the Straits of Magellan is one of the rainy regions of the world. A great antarctic current strikes Tierra del Fuego on the south side. A fraction of it takes a direction a little to the north of east towards the Cape of Good Hope; but the mass of it finds its way along the west coast of Patagonia, under the name of the Humboldt current, until it is lost in the mighty equatorial stream which moves majestically westward across the Pacific ocean.

On the Atlantic side of Patagonia, we have another equatorial current setting southward, and so heated that, on any parallel of latitude between the mouth of the Plata river and the Straits of Magellan, it is six degrees warmer on the Atlantic side of the continent than it is on the Pacific side, the temperature of the latter being lowered by the antarctic current I have mentioned. In consequence, the colder atmosphere of the Pacific coast rushes eastward through the wide glacier-filled valleys of the low Patagonian Cordillera to fill the vacuum created by the heated belt on the eastern slopes of the mountains, and the result is an abundant rainfall among the eastern foothills of the Andes and that long series of lakes which has been shown to us this evening, thirty to forty in number, nearly all of which lie along or near to the 72nd degree of longitude west from Greenwich. These not only collect the storm-waters, but the flow from the glaciers and the melting snows, and, through deep gorges across the tertiary formation of Patagonia, send their surplus waters to the Atlantic. It is a curious fact that, generally, these gorges in Patagonia, from the Rio Negro to the Straits of Magellan, run nearly east and west. If we start from the *massif* of the Andes in Bolivia and move southward, we find that almost all the inter-Andean depressions run nearly north and south until we reach about lat. 34°, and that these have been so terribly eroded in past geologic ages that the valleys are filled to a great depth with shingle, as, no doubt, Dr. Moreno can confirm. These characteristics continue nearly to the northern frontier of Patagonia; but south of this, the depressions change their course, as I have said, to east and west. This seems to indicate that Patagonia was once a vast archipelago, cut by numerous inter-oceanic straits and fiords, filled with great glaciers, which, as they disappeared, denuded the mountains and formed that vast tertiary Patagonian plain which so attracted the attention of Charles Darwin.

It is notable that the continental divortia aquarum are not always found in the Cordillera of the Andes, and this is especially true of Patagonia; for the water divide is frequently far east of the mountains and in the middle of the great

Patagonian plain, from which rivers flow westward through the Andean gorges (the straits of the ancient archipelago ?) into the Pacific ocean.

Similar examples, but perhaps not originating from the same cause, are found along the whole extent of the Andean Cordillera. There is an instance in Bolivia: the La Paz river, which I have descended, rises between the main and coast ranges, cuts through the former, and pours north-east into the Beni valley.

In my travels in Ecuador, I found several rivers which rise on the slopes of the inland mountains, cut through the coast range, and empty into the Pacific ocean. The Pastassa river rises on the inter-Andean plateau, and carves its course through the inland range eastward to the river Amazon. The most notable instance is the Guallabamba river, which rises on the slopes of Cayambi and Cotopaxi, those great volcanic cones of the inland Cordillera overlooking the basin of the Amazon. The Guallabamba has, through a vast deposit of volcanic detritus and ash, scored for itself a profound bed, a mighty gorge which I crossed some years ago with great difficulty, and found by barometric measurement to be 2000 feet deep in a distance of only half a mile. The river has sawed westward through the Pacific coast range around the northern base of the volcano of Pichincha and found its way to the Pacific. When Cotopaxi is in eruption, and its melting snows swell the volume of the river, nothing can withstand the grinding force of the rock-and-mud-laden waters, which, in a tremendous wave, race onward to the ocean.

It is too late to say much this evening; but let me add that I am delighted that Dr. Moreno has made the suggestion to send an expedition to Patagonia to make further explorations. It is a field brimful of interest, and destined to become an important province of that young and vigorous country the Argentine Republic, the progress of which so challenges our admiration. Its enlightened Government might well find it a highly profitable venture to supply the necessary funds, and entrust to our Royal Geographical Society the organization and direction of an expedition to complete the work so admirably commenced by Dr. Moreno.

The PRESIDENT: It is now my great pleasure to invite you to pass a vote of thanks to Don Francisco Moreno for his valuable paper. Speaking for myself, and probably for the rest of the meeting, I can say that I have never before learned so much new geography in so short a time. It is many years since we heard anything of this Eastern Cordillera at one of our meetings. I think it is at least thirty-five years ago since Sir Woodbine Parrish communicated a paper from Don Manuel Cox, and though he described Lake Nahuel-Huapi exceedingly well, we could not then have such an idea of its beauties, as we have received from the magnificent photographs of Don Francisco Moreno. I had also heard of Lake Viedma, otherwise the whole of these lakes are entirely new to me. They appear to have been the ends of fiords, exactly like those on the western coast, but we were until this evening in ignorance of their exact positions. We knew, of course, from the descriptions of Charles Darwin, of that great tertiary plain and of its terraces, for I suppose it is now established that the word Patagonia is the same as the Quichua, *Pata*, "a terrace," and *cerna*, the plural particle, meaning "the land of terraces," exactly as Charles Darwin has described them; but we knew nothing of this marvellous country at the foot of the Cordillera, and for this knowledge we are indebted to our friend, Señor Moreno. I don't doubt that the new tracts he has described will in the future become a very important country, that there will be great cattle farms along the eastern Andes, and that there will be large hotels on the shores of Nahuel-Huapi frequented as health resorts, not only by South Americans, but by Europeans. We have always had most friendly relations with the geographers of Buenos Aires and the whole Argentine Republic, and I trust that that friendly feeling will always continue. Science has to thank Don Francisco

Moreno for the establishment of the museum at La Plata, where geographers are instructed, where information on the geography and geology of the country can always be obtained, and which has been visited by Dr. Lydekker, who I regret is unable to be present this evening through illness, as well as by other Englishmen.

You will therefore, I am sure, feel that we owe a very large debt of gratitude to Don Francisco Moreno for all his labours during many years, and more especially for the delightful evening he has given us, and the beautiful views he has shown us. I now ask you to pass a vote of thanks to Dr. Moreno for his paper.

A TRIP TO THE CHINESE SHAN STATES.*

By FRED. W. CAREY.

Geography of the Route.

From Sumao our route led almost due west. As soon as we left the Sumao plain we commenced to ascend the first of the numerous mountain ranges which run parallel to the Me Kong. But during the whole of our trip we crossed no range of any great height. Nature's best attempts at elevation in the regions south and west of our starting-point never exceeded 7000 feet. Her greatest efforts seem to have been reserved for places further north; for, as the Me Kong grows in size and importance, so the mountain ranges diminish in height, until the extensive low-lying plains of Eastern Burma and French Laos are reached.

On the morning of the third day we arrived at Lung Tang, the capital of Liu Shun, one of the twelve Shan districts known by the name of "Sip Song Panna." These twelve states are subordinate to the principality of Kiang † Hung; but for many years the Prince, or "Sao Beva," of that place has been unable to maintain more than a nominal supremacy. Tribute is still paid by eight of these twelve districts; the amount, however, is ridiculously small, and is dependent almost entirely on the goodwill of the respective chieftains, who are called "T'u Ssŭ."

The "Sip Song Panna" was to have formed part of the "Buffer State"—proposed in 1895, but found impracticable. More than one hundred years ago the "panna" was enumerated as follows:—

1. Meng ‡ Wang.	2. Cheng § Tung.
3. Pu Teng.	4. Wu Tei.
5. Meng Wu.	6. Liu Shun.
7. I Bang.	8. I Wu.
9. Meng La.	10. Meng Lung.
11. Meng Cheh.	12. Meng Ah.

* Map, p. 472.

† *Kiang*, the Chinese equivalent of the Burm. *Keng*, Siam. *Chieng*.

‡ *Meng*, the Chinese equivalent of Burm. *Mong*, Siam. *Muang*.

§ *Cheng* = Keng.

Though since that time many changes have taken place, eleven of the subordinate states can still be defined with a certain amount of accuracy. The twelfth—Meng Ah—seems to be irretrievably lost to record and recollection.

The first three are situated in the "Hsien," or district, of Ning Erh, which belongs to Pu Erh-fu. Wu Tei and Meng Wu were neglected, or rather never properly occupied, by the Chinese, and recently became French territory. The chief towns, named respectively Muang-U-Nua and Muang-U-Tai, are situated on the Nam U, a river which joins the Me Kong just above Luang Prabang. The remaining seven

VIEW OF THE YUAN CHIANG VALLEY FROM MO-LANG-PO.

districts are in the prefecture of Sumao, and under the direct jurisdiction of the Sumao T'ing.

The history of the "Sip Song Panna" seems to have been a series of disputes about the succession; and desultory fighting for the supremacy was kept up for years, and until quite recently, between rival chieftains. At one time the T'u Ssŭ of Liu Shun, having beaten the Prince of Kiang Hung, was the acknowledged head. But, having aroused the jealousy of other chieftains, he was defeated in battle, and the Kiang Hung Prince again reigned supreme.

Of late years Liu Shun has been under the more direct control of the Chinese. In 1884, some dispute having arisen, sharp fighting took place between the Chinese and the followers of the Liu Shun "T'u Ssŭ." For three weeks the Chinese besieged Tao Kuan-chai, the chieftain's residence,

without any marked success. Then they had resource to strategy. Their commander sent in a flag of truce inviting the "T'u Saŭ" to a parley and repast. Not suspecting treachery from a man with whom he had formerly been on very friendly terms, the T'u Saŭ accepted the invitation, and was killed whilst sitting at table. Discouraged by the loss of their chief, the Shans soon afterwards surrendered, and the trouble ceased. Tao Kuan-chai, which lies in the north-western end of the Sumao plain, was laid in ruins, and the "Pai I" retired to Lung Tang. There is still a very fine Burmese temple at Tao Kuan-chai, which, despised by the Chinese and neglected by the Shans, is fast falling into decay.

THE GREAT RAPID, RED RIVER.

I-Wu and I-Bang are too well known as the famous "Tea Districts" to need much description. They are the most Chinese of all the Shan states, there being at both places a fairly big Chinese population engaged in the cultivation of tea. Malaria is so prevalent in five of the ten "panna" which remain to China that the Chinese will not dwell in them. Witness the complete abandonment of the Yu Lo—a town which formerly ranked as an assistant sub-prefecture. For the same reason the Chinese officials can exercise no more than a nominal control over those districts. The actual *military* jurisdiction of the Chinese does not extend more than a few miles to the west or south of Sumao.

Meng La lies to the south of the I-Wu "Panna." In the south-

eastern corner of this district are situated numerous salt wells, capable of producing large quantities of salt, but the inhabitants are too lazy to work them.

Meng Lung lies on the right bank of the Me Kong, below Kiang Hung, and contiguous to the State of Kiang Kheng. The district produces a little cotton, and the chief town is on one of the main caravan routes from Burma.

Meng Cheh is perhaps the most important of the twelve "panna." It lies due west of Kiang Hung, and east of the State of Meng Lem, or Meng Lien. In 1897 the T'u Ssŭ of Meng Cheh rebelled against his

THE RED RIVER AT HSIUKAI.

suzerain—espousing the cause of the prince's younger brother, who had designs on the throne. The prince's forces were worsted in the sanguinary conflicts which followed; but the provincial authorities then ordered the Sumao T'ing to go down and put a stop to the fighting. He visited Meng Hai—a place lying about halfway between the two capital towns—and managed to patch up a peace between the disputants. He was the first Chinese *civil* official to visit the "Sip Song Panna." Many of his soldiers were carried off by malaria *en route*, and the T'ing himself contracted a fever from the effects of which he died shortly after his return to Sumao.

Some writers have included Meng Ah with Meng Cheh. All trace of the Meng Ah mentioned in old histories seems to be lost, though the Chinese are positive that it was situated to the west of the Me Kong.

One important place to the west of that river, Meng Wang, was, years ago, included in the marriage-portion of a Liu Shun T'u Ssŭ's wife. I think it probable that this place formed part of Meng Ah; and the remainder of that legendary "panna" may have been forcibly annexed by the bellicose state of Meng Cheh.

The principality of Kiang Hung lies athwart the Me Kong. It is called by the Chinese Chiu Lung-chiang, or Ch'e Li. The capital town, Chieng—written Xieng in those wonderfully accurate old Jesuit maps—is situated on the right bank of the Mekong, in lat. 21° 58′ N. There dwells the prince, Ham Lü. He has also a residence at Hsiao Meng Yang, a place some 60 li north-east of Chieng. His excellency, Ham Lü, has a rascally reputation, and is constantly at variance with his subordinate Fu Ssŭ.

Each "panna" is subdivided into so many divisions ruled by "Tsung Pia"—who often by courtesy are styled T'u Ssŭ. The Chinese have also given them the military rank of "Pa Tsung," equivalent to our sergeant. The "T'u Ssŭ" of a "panna" holds the hereditary rank of "Chien Tsung"—or Lieutenant—in the Chinese army.

For the rest, the Shans have very much the same system of village government as the Burmese.

Two days after leaving Lung Tang we reached the Me Kong, and the day following, after a long and arduous climb, arrived at Ta Ya-K'u. There we rested two full days, then, having obtained the necessary information and a guide, we decided to push on south to Meng Hai. By making our stages longer than usual, we managed to reach that place in five days from Ta Ya-Ku. Meng Hai is the centre of very extensive tea districts. From there our route led due east to the capital of Kiang Hung-Chieng, a journey which took us two days only. Crossing the Me Kong again, we turned our faces once more in the direction of Sumao, and following the usual caravan route, arrived home seven days later, having rested one day *en route* at Hsiao Meng Yang.

INHABITANTS OF THE COUNTRY.

The Shans, who people the greater part of the "Sip Song Panna," are allied more to the Siamese than to the Burmese. They extend over a wide area, and branches of the same family are to be found under various names as far east as Kwang Hsi. The French call them Lü or Tai, and the Chinese "Pai I" or T'u Chia.

The "Pai I" generally build their houses down in the plains near running water. They are very cleanly people; and their houses, made of bamboo, are usually constructed above the ground on roughly hewn poles. Unlike the Chinese, they do not crowd together in large communities, preferring rather to live in many separate villages with an average population of five hundred souls. Kiang Hung itself consists of more than fifteen such villages scattered over a large area.

In fashioning articles from bamboo the Shans are fairly clever; but they can work neither wood, stone, nor metals. The women are pretty and industrious, the men ill-favoured and indolent. Rice grows without trouble in their fertile plains. The cultivation of tea or a little opium pays for their luxuries, as for the silver ornaments which their women like so well. Their ignorance does not seem to weigh upon their consciences, and they have the appearance of living contented and fairly happy lives.

A very large proportion of the aboriginal tribes scattered over Yunnan and Kweichau are of Shan origin. Amongst these may be mentioned the T'u Lao of Mengtse (not to be confounded with the Tu

THE CHANG LO-PING SUSPENSION BRIDGE OVER THE HO-MA RIVER.

La, a Lolo tribe), the Lung-jen of Kai Hua, the Min Chia of Ta-Li, and Chin Tung, and the Sha-jên of the Red River valley.

With the Shans in the "Sip Song Panna" must be classed the "Akka," descendants of a subjugated race who have lost their original language, though they still retain many customs which differ *in toto* from those of their conquerors. They have their habitations up in the mountains, where they cultivate maize, tobacco, and millet. The women are very scantily attired; they wear little beyond a short pleated kilt; but seem to be fond of decking their bodies with silver ornaments. Though the "Akka" have conformed more or less to the habits and customs of the Shans, they certainly belong to a different race, and I hope to learn something of their history before leaving Yunnan.

In places along the route we met people belonging to the race of Lolos; a generic name for many tribes of the same family in Yunnan and Suchuan, whose origin seems to be wrapped in myth and mystery. All the information that we have concerning the ancient history of these people is speculative. At present they are practically "hewers of wood and drawers of water" to the Chinese. They are identical with the "Tsuan-man"—a people occasionally mentioned in old Chinese chronicles of Yunnan—but it is impossible to get any definite idea of their real origin. Some writers have described them as the Black Branch of the Aryan family. Their arguments, however, are far from being conclusive, and there is just as much reason to suppose that they are the descendants of the lost tribes of Israel. Indeed, recent research shows a certain resemblance between Lolo legends and our own old Biblical stories—a fact which could be enlarged upon were there not so many religious ideas and beliefs common to all humanity. Diligent enquirers are discouraged by the vague ideas of the natives themselves on the subject of their ancient history; and as the Lolos are fast losing their distinctive characteristics by intermixture with the Chinese, there is every year less chance of anything certain being discovered.

The Lolos may be divided into two branches—the *Superior* and the *Inferior*. To the former belong the Pu La of Mengtse and A Mi-chu, the Tu La (Kai Hua district), the Ta T'ou of Sumao, and the Lo Hei of Chên Pien. These latter are only met with to the west of the Me Kong. The Pu Tu, Woni, Kato, and Ma Hei belong to the Inferior branch. These tribes, with the exception of the Ma Hei, who dwell around Pu Erh and Sumao, are to be found almost anywhere between the Red River and the Me Kong.

The Lolos live up on the plateau and are very industrious; cultivating rice, tobacco, and opium. In the "Sip Song Panna" they rent their lands from the Shan T'u Ssŭ of the district, but they are also taxed by the Chinese, an imposition which they resent. They are fond of music and dancing—amusements which they frequently indulge in on moonlight nights. To Europeans they have always proved themselves hospitable, but they do not extend the same regard to the Chinese. Neither does this seem remarkable when one remembers that the latter often deprive them of their lands, their property, and their liberty.

The Me Kong.

Our first view of the Me Kong was somewhat disappointing. Shut in by mountain ranges rising away up to 5000 feet on either side, the appearance of the "great artery of the Indo-China" did not equal our expectations. We crossed at the Chiang Pien Ferry. The height of the river there is 2250 feet above the level of the sea. From bank to bank at high water, *i.e.* during the rainy season, it is not more than 200

yards wide. When we crossed (April), the width did not exceed 130 yards. The current is rapid, and the water of considerable depth. The ferry consists of a large but clumsily built boat capable of accommodating eight or nine pack-animals.

Malaria is very prevalent in the valley of the Me Kong, and in the plains to the south-west of Sumao. The Shans suffer from the usual "ills which flesh is heir to," but do not seem to be affected by the fever. I have come to the conclusion that the cause of such great mortality amongst the Chinese who visit those places must be sought for not so much in the water, altitude, heat, or situation of the plains, as in the physical frailties of the men themselves. Brought up generation after

THE SUSPENSION BRIDGE OVER THE PAPIEN RIVER.

generation in the highlands of Yunnan, in a too equable climate, they can bear neither extremes of heat nor cold. Under favourable conditions they can perform feats of endurance impossible to the European; but, once attacked by fever, they succumb very quickly.

We had no sickness amongst our little party during the journey, but on our return to Sumao, two men were seriously ill for some time. Along the route we met many parties of tea and cotton porters coming up from the lowlands. These men live very hard lives, carrying heavy burdens all day, and sleeping at night in the open on the damp ground. We passed many hastily made graves, and once we saw two men lying by the roadside stricken with malaria. They had been deserted by their comrades, and were waiting for the end. Death comes to them,

so the Chinese say, in the shape of a beautiful young girl—a poetical fancy which has its origin probably in the wild babblings of dying men.

We crossed the Me Kong again at Kiang Hung. There the elevation of the river is 2100 feet—150 feet lower than at Chiang Pien. The river, running through a big plain, had widened considerably. The ferry was composed of two long narrow boats lashed together, and with a bamboo platform on top. There were a few small fishing-boats working up the shallows near the banks; but we saw nothing in the shape of any vessel capable of really navigating the swift waters of the river.

Occasionally one hears rumours of attempts to navigate the Me Kong

MANHAO.

further south, and a small French gunboat is to try and reach Kiang Hung this summer (1898), when the river is in flood. But, though such undertakings are laudable enough in the interests of science or geography, they will never be able to prove that the Upper Me Kong is navigable from a commercial point of view.

Ta Ya-Ku.

One of the reasons which led up to this trip was a desire to find out the actual position and status of Ta Ya-Ku, a place of whose importance as a trading centre we had heard much. It is a small commercial entrepôt situated 5200 feet above the sea, and 60 li (20 miles)

from the right bank of the Me Kong. Most of the residents are either petty Chinese traders, or agents for Sumao tea and cotton merchants.

Ta Ya-Ku is made up of three villages—Yu Tang, Ying Pang, and the Kai-shang, or market. The population of the latter place is about five hundred. Shortly before my arrival it had been almost entirely destroyed by fire. The buildings are of the usual wooden-framed, mud-wall, and straw-thatched kind, seen everywhere in Yunnan, and fires occur periodically every five years or so, being sometimes attended with loss of life. There are only two brick-tiled houses in the place; but in this respect it is better off than Chen Pien, the capital of the prefecture, which does not possess a single one. Chen Pien is only

SUMAO FROM THE WEST.

three short stages from Ta Ya-Ku, but is a less important and smaller place.

A market is held every sixth day at Ta Ya-Ku, it being difficult at other times to buy even the ordinary necessities of life. Cotton, tea, and opium are brought in from the Chen Pien and Meng Lien (Meng Lem) districts (and some from beyond the frontier) to exchange for salt, native cloth, iron pans, and ironware, imported from Sumao. Money is little used in commercial transactions in the Shan states, there being instead a complicated system of barter. Cotton is usually exchanged for its weight in salt—a transaction particularly advantageous to the Chinese merchant. Every picul of cotton laid down at Sumao

is a source of profit to him of about 5 tae's. In the rainy season, however, the owner of the cotton does not part with his goods so cheaply. He then requires a little silver in addition to the salt.

Most of the tea and cotton is sent to Sumao, the remainder going by various routes to Tali, Mien Ming, or Shunning-fu.

On market days the smaller tradesmen lay out in the street their stock of matches, empty bottles (a much-prized article in Yunnan), tobacco, flints and steel, etc., and bargain for opium with the native visitors in regular Cheap-Jack style. Amongst the frequenters of the market I noticed some K'a Wa, members of a particularly savage and ferocious tribe who inhabit the Chen Pien and Shunning districts. They are said, by the Chinese, to worship the heads of tigers and men recently killed. But, as the Chinese are quick to invent equally remarkable tales about any alien race, such statements should be accepted with caution.

Trade and Trade Routes.

Tea is the principal product of the Chinese Shan states. The best known districts are I-Wu and I-Bang. Chinese—mostly Shihping people—have settled in considerable numbers at both those places, and themselves superintend the cultivation of the shrub. But the largest, and therefore the most important tea-hills, lie to the *west* of the Me Kong. They produce every year more than three times the total output of I-Wu and I-Bang combined; but, the districts being too unhealthy for the Chinese, the cultivation is entirely in the hands of the "Pai I," and the tea, lacking the Chinese treatment, is of inferior quality. Meng Hai is the chief market, and the price there varies from 4.50 taels to 8.00 taels per picul.

There are no reliable statistics of the tea trade, but it is estimated that the districts of I-Wu and I-Bang yield about 10,000 piculs, and the Meng Hai districts 30,000 piculs, yearly; a total of 40,000 piculs. About one-third of this quantity comes to Sumao, where it is sorted, pressed into cakes, and packed for exportation to all parts of China. A little tea is also grown in the Chen Pien prefecture, near Meng Mang.

The best quality, including the "tribute tea," arrives at Sumao between the third and sixth moons. That destined for Imperial consumption is then specially packed and forwarded to Peking. Before reaching its destination, it has to pass through so many official hands that the quantity is very greatly diminished. A small quantity of a peculiar extract of tea, resembling brown sugar, is also made here and sent to Peking. During the four months mentioned no merchant is allowed to purchase that quality from which the "tribute tea" is chosen, and the likin on *all* tea arriving at Sumao is doubled.

The merchants here sort the greater part of the tea into three kinds. The first is pressed into circular cakes, and goes to the capital of the

province, Yunnanfu, where it is often sold for as much as 40 taels per picul. The second is also made up into cakes, and is the ordinary "Pu Erh" tea of commerce. One meets with this kind everywhere from Bhamo to Shanghai. The third quality, consisting of stalks and refuse tea, is sold to the Yunnanese Thibetans, who come down to Sumao from A Teng-tse and Li Chiang-fu between the tenth and second months of the Chinese year. There are other qualities of tea of an uncommercial kind, varying in value from 10 taels to 120 taels per picul.

During our trip the route led for several days through the Meng Hai and Meng Lung tea districts. The average height of the hills was 4000 feet above sea-level. The tea is grown under the shade of big

TEMPLE NEAR SUMAO, CONTAINING LARGE GILT BURMESE GOD.

trees. The appearance of some of the tea-shrubs indicated great age. Their height is usually over 6 feet, and those we saw were very roughly pruned.

Hundreds of "Pai I" (Shan) women and girls were busy picking the leaves, which they put into cotton bags slung around their necks. They worked in a good-natured way, and greeted our little caravan with jests which were scarcely polite. The Shan women are, to say the least, extremely unconventional. Their most conspicuous article of dress is a long skirt, with multi-coloured borders, reaching to their ankles. On special occasions they wear a pretty kind of bodice, but they evidently did not think it worth while to treat my appearance as a "special occasion."

When a sufficient quantity has been picked, the tea-leaves are turned out on bamboo matting and "bruised," the girls kneading them with their hands, as if working dough. They are then spread out in the sun to dry. During the drying process, the tea has to be turned over and occasionally shaken. This is done mostly by children and chickens. It is then ready for sale, and is weighed and packed under the purchaser's supervision.

A great many tea caravans leave Meng Hai for Tali and other northern markets direct. They cross the Me Kong at the Chon Kung ferry, keep up the Man Pan valley, and pass through Wei Yuan and Chin Tung. Traders going down to Kiang Tung (Meng Keng) also purchase small quantities on the spot; in fact, tea from Meng Hai finds its way in every direction.

Cotton, which forms our principal import, comes from the immense plains lying either side of the Me Kong, south of the Chinese frontier; from Kiang Kheng, and Kiang Tung. Cotton caravans on their way to Sumao cross the Me Kong at Kalampa, or Chen Kung. Many small routes converge at Ta Meng Lung. About 16,000 piculs of cotton enter Yunnan yearly through Sumao.

Opium is grown in small quantities in all parts of the Shan states. It is bought in exchange for cloth, silver ornaments, silk thread, etc., by Chinese peddlers, who bring it to Sumao for sale. It is of slightly superior quality to the ordinary Yunnan opium, and the supply is amply sufficient for local consumption. Around Sumao, the soil being unfavourable, not much opium is grown. The annual production of Yunnan amounts to about 45,000 piculs. Opium smoking is very general throughout the province, it being the exception to find a man not addicted to the habit. The Shans usually eat the drug, but they have lately taken to smoking it.

Miscellaneous Notes.

A little trade passes through Meng Sing, but the Muong Hu districts are very unproductive. There is a route to Luang Prabang which is little used, there being practically no trade in the whole of that region. Trade, *viâ* Meng Lieh, is also of a very unimportant nature, and rumours of a brisk caravan business with Talang have no real foundation.

There is scarcely any demand for foreign goods at Sumao. Japanese matches and Cantonese tobacco are reported here from Mengtse. Enough cotton cloth is made here to satisfy local needs. The Shans also manufacture a coarse but strong kind of cotton cloth for sale to the Chinese.

In November of each year a few Mahommedan traders from Yunnan, Tali, and Hsin-hsing, pass through Sumao on their way to Mandalay, Rangoon, Chieng Mai (or Zimme or Siam) and Mulmein. They return regularly during the month of June, bringing with them small

quantities of grey shirtings and woollen goods. But, even if there were a demand for foreign goods, the cost of transport is prohibitive—all merchandise being carried by pack-animals throughout Yunnan and the Shan states. These Mahommedans confine their business operations to Burma, the money which they make there being brought back in the shape of rupees. Rupees are in great demand in Yunnan-fu—a demand which arises out of the silver question and the vagaries of exchange—and which, therefore, cannot be discussed in this memorandum.

The merchants of Sumao have no agencies in Burma, and their dealings are in consequence confined to frontier produce, *i.e.* tea and cotton. Under existing conditions it is impossible to anticipate the rise

TIBETANS IN MARKET AT SUMAO.

at Sumao of a foreign trade sufficient to satisfy the local requirements of the surrounding districts of south Yunnan. As regards the dream that Sumao might become a great distributing centre for the whole province, its realization seems impracticable.

Mengtse—owing to its proximity to the tin mines of Kuo Chiu—the acknowledged superiority of the Tongking (Red river) route, and the presence of enterprising Cantonese merchants, *is* such a centre.

Teng Yueh, with its close commercial connection with Bhamo, once opened, and the transit pass system with its advantages put into force, may become such a centre.

But Sumao possesses none of these advantages. It is far from any

trading centre in Burma or Tongking, and there is not a single Cantonese "Hong" resident here. In fact, it seems destined to remain the centre of a small circle of frontier trade.

There is no product of the Shan states or of southern Yunnan which holds out any promise of ever becoming an important article of export. The samples of "Pu Erh" tea which have from time to time been sent to various foreign markets, have not been favourably received by the public. Unless some æsthetic wave alters the present prevailing taste, there can be no demand in the future for what might be a fairly important export. And, in any case, cost of transport would effectually prevent it from competing with Assam, Ceylon, or other commercial teas.

SOUTH GATE STREET, PRINCIPAL BUSINESS THOROUGHFARE OF SUMAO.

Of the other two important products of Yunnan—tin and opium, the first is entirely a Mengtse export, and the latter is, of course, for internal consumption, though a considerable quantity is also exported *viâ* Mengtse to Tongking. The remaining exports—furs, medicines, white wax, wool and copper, are products more of the western and northern parts of the province. Most of these find their way to Shanghai *viâ* the Yangtse, and a part may eventually seek the Teng Yueh route; but possible goods for carriage by projected Yunnan-Burma railways are difficult to think of. Indeed, any one who has travelled in Yunnan, and has seen the general poverty of the inhabitants, and the extremely mountainous nature of the country, scarce believes that such an enterprise as a Burma-Yunnan-Suchuan railway is contemplated seriously.

The only practical line (I speak from a financial and commercial—not from an *engineering*—point of view) would be one from Laokai, on the Red River, to Yunnan-fu *viâ* Mengtse. Such a line is already contemplated, and the route has been surveyed by French engineers. But, except the short one from Lang-thuong to Lang-Son, there are as yet no railways in Tongking itself, and it would be safest, therefore, to leave the hope of ever seeing such a line completed as a legacy to our children's children.

I only wish to point out here that the talk of the necessity of railways for "tapping the prodigious resources of Yunnan" is all nonsense. The majority of persons who hold these ideas are either blinded by a genuine desire to see British trade benefited, or led astray by the statements of (1) those who would benefit by the *construction* of such railways, (2) those who, on the strength of a visit to Shanghai, like to be regarded as authorities on all questions concerning the Far East. To those who cannot study this question on the spot I recommend the perusal of Baber's notes, and Bourne's official report. They will then know what is the commercial worth of "map railways."

At two of the most effective points on the Me Kong—the Chen Kung and Chiang Pien ferries—there are stations for collecting a Prefectural tax. Though the receipts at both these places should be considerable, the figures as repeated to the head office at Sumao are insignificant. The climate is so unfavourable to Chinese that the staff is always quite inadequate to enforce the tax, and the collectors are obliged to accept what the tea and cotton traders are willing to pay.

There are Likin stations at I-Bang, Man Nai, and Meng Lieh only. No difficulty seems to be experienced by the collectors in those places, and the posts are sufficiently coveted to give one the idea that the emoluments are by no means small. Likin is collected on all tea and opium.

The Chinese foreign customs has branch stations at Meng Lieh and I-Wu, but they are failures from a revenue-collecting point of view. The collection of the head-office at Sumao is not enough to pay the working expenses of the customs there.

Conclusion.

Robbery with violence is as rife now in the Shan states as it formerly was in Burma before that country became British territory. That the benefits of British rule are actual and lasting is testified by all traders coming from Kiang Tung to Sumao. But they complain bitterly of the precautions which they are obliged to take to prevent their goods or cattle from being stolen when once they have crossed the frontier. The worst offenders are not the Shans, but Chinese—recognized robbers, who have their homes and families at Sumao and Pu-Erh, and are comparatively well-to-do. No official yet has had the temerity to interfere

with these questionable residents, though a small military mandarin is occasionally detached on a wild-goose chase after thieves who have raided some neighbouring village.

A small but well-organized police force could sweep these ruffians, who do a great deal of harm to trade, out of existence in a very short time; but it is hopeless to expect any such measures being employed by Chinese officials.

Were it not for the situation of the I-Wu and I-Bang tea-districts, the Chinese would look with equanimity on the absorption of the Shan states by foreign powers. The officials recognize that with the means at their disposal they cannot put down brigandage, and that climatic conditions prevent them from exercising proper control over the people of the Shan states. As a solution of their difficulties, they look forward to the time when the old northern boundary of the "Sip Song Panna" shall form the south-western frontier of the province of Yunnan.

SUBMARINE GULLIES, RIVER OUTLETS, AND FRESH-WATER ESCAPES BENEATH THE SEA-LEVEL.*

By HENRY BENEST, Assoc. M. Inst. C.E.

It is the object of this paper to direct attention to the existence, below sea-level, of phenomena of which comparatively little is yet known, but which must exercise a marked influence in altering the conditions of the sea-bottom on many continental slopes.

The frequent occurrence of cable fractures in submarine telegraph lines suggests various theories to account for these unwelcome interruptions. Unmistakable evidence, afforded in some cable repairs of recent years, has disclosed novel causes of rupture, and has extended our knowledge of the hidden dangers that beset the telegraph wire after it has been consigned to its oozy bed. 'Tis an ill wind that blows no good at all. These accidents to cables have already been valuable to science and sub-oceanic research, in directing the attention of geographers to hitherto unsuspected forces constantly in action and altering the features of the sea-bottom.

At localities far apart on the Earth's surface, men, engaged in the fascinating work of seeking, fishing up from the depths of the sea, and joining together again these nerves of the sentient world, come across identical tokens of powerful forces which are silently undoing in quick and merciless fashion that which human skill, ingenuity, and perseverance has been at so much pains to accomplish. However carefully planned and carried out a survey may have been, prior to laying a system of ocean cables, breaks have occurred, sometimes within a few months of their laying, and, what is most remarkable, at depths that have been looked upon as safe—the character of the bottom, as disclosed by the sounding-tube, being of that oozy nature so favourable to the longevity of a cable.

Such were the circumstances attending the fracture of the South American

* Charts, see p. 472.

Company's cable off Cape Verde three months after its laying, at a depth of 1220 fathoms, on an ooze bottom; and again in 1895, two years and two months later and within 20 miles of the first break, the depth being on this occasion 1574 fathoms. The writer was entrusted with the work of re-establishing communication through this cable on each occasion, and, having been closely connected with the manufacture at Silvertown, and the subsequent laying of the cable between Brazil and the African coast, he naturally took a greater interest than is usual in the ordinary run of repairs to cables which have broken down through age and ordinary wear and tear. That which is here narrated is partly from the writer's own personal observation, and partly from the observations of other officials of the India Rubber Company, these experiences being supplemented by references to valuable contributions from officials of other cable companies.

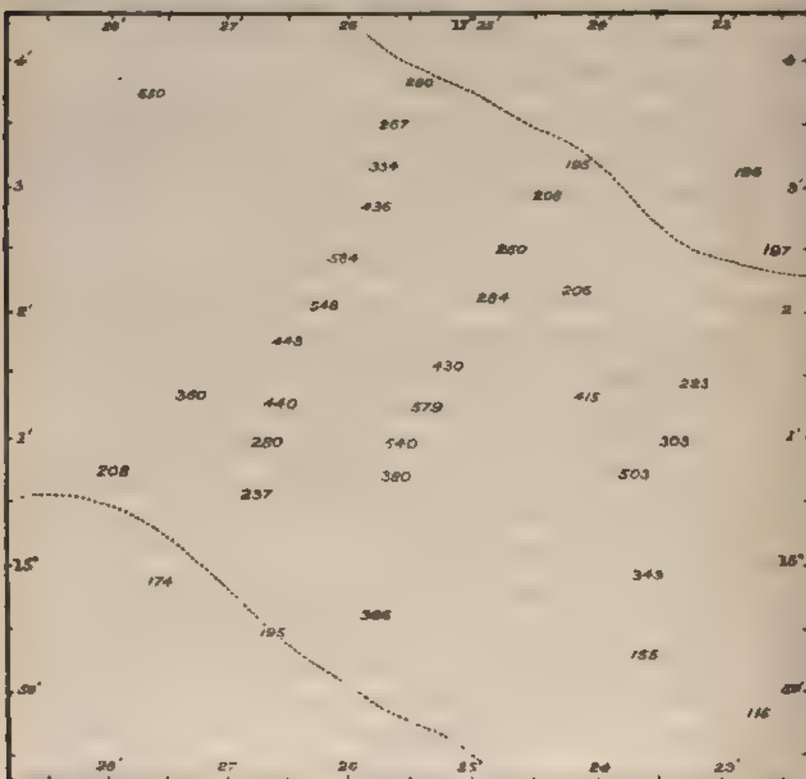
The great number of soundings that were taken during these particular two repairs gave indication of the curious formation of the sea-bottom off Cape Verde. It will be observed, by the chart, and profile sections of the sea-bottom, that a distinct gully exists nearer to the coast than the cable line, and although its delineation is not very sharp at the 761-fathom station, the conclusion come to is that a submarine outlet to an underground river exists near this spot. Following the contour-lines towards Cape Verde, two soundings of 675 and 531 fathoms respectively, still nearer inshore than the 761-fathom sounding, will be observed. Profile sections, to true scale, across this part of the gully are here shown. To the north and south of these sections, the depth, it will be observed, on each side of the easternmost one is 195 fathoms, and to the north and south of the western profile section, 280 fathoms and 174 fathoms respectively. Farther out, near the mouth of the gully, at the 675-fathom spot, the depth shown to the south is 202 fathoms, and 392 fathoms lie north of it, on a gradual incline rising from the 675 fathoms at the deepest part. Two of these profile sections of the gully in the vicinity of the 675-fathom sounding were drawn from soundings taken during a repair made in 1897 to a coast cable which connects St. Louis and Yof bay, after it had lain in peace across the 761-fathom depth at the mouth of the gully for thirteen years.

The South American cable, at the second repair in 1895, was diverted to a course which brought it parallel with, and close to this coast cable, and it would appear probable that those two cables are now lying on a ledge above and overhanging the submarine river outlet we suppose to exist there, and that the vast mass of mud and detritus from this source may now flow to the westward and spread slowly outwards along a time-worn furrow on the sea-bottom without meeting a cable laid across its path.

The contour lines on the chart may be taken to indicate a probable channel way, or submarine ditch, that may be imagined at some remote period to have been grooved out by the constant action of water making its way to the sea through a surface river outlet, in connection with, or having its course through, localities on the mainland where the lagoons are now situated, and which, in turn, may have been connected with a great inland river. The Admiralty charts, and those of the French Depôt Général de la Marine, give indications in support of such a supposition.

A river, the higher reaches of which are crossed by the railway between St. Louis and Dakar, now discharges, in the wet season, into these lagoons, but in the dry season the water disappears in the sandy bed before reaching the neighbourhood of the coast. Water is always present, the river exists behind these lagoons, which are in a direct line between that river and the head of the gully. These facts are significant of a former surface outlet, and a submarine connection between river, lagoons, and the sea at the present time.

There are other localities in the world where the physical features on the sea-bottom indicate that at a former period rivers have discharged into the sea, their ancient course now being indicated by submarine gullies. Owing to slow but stupendous changes during the lapse of ages, such rivers have been, doubtless, diverted to subterranean courses, and, their waters escaping beneath the sea at a distance away from their former outlets, now cause disturbance on the ocean floor at greater depths; this effect being brought about largely by the silting up of the old channels near to, and extending over, the coast platform of the "continental shelf" within the 100-fathom line.

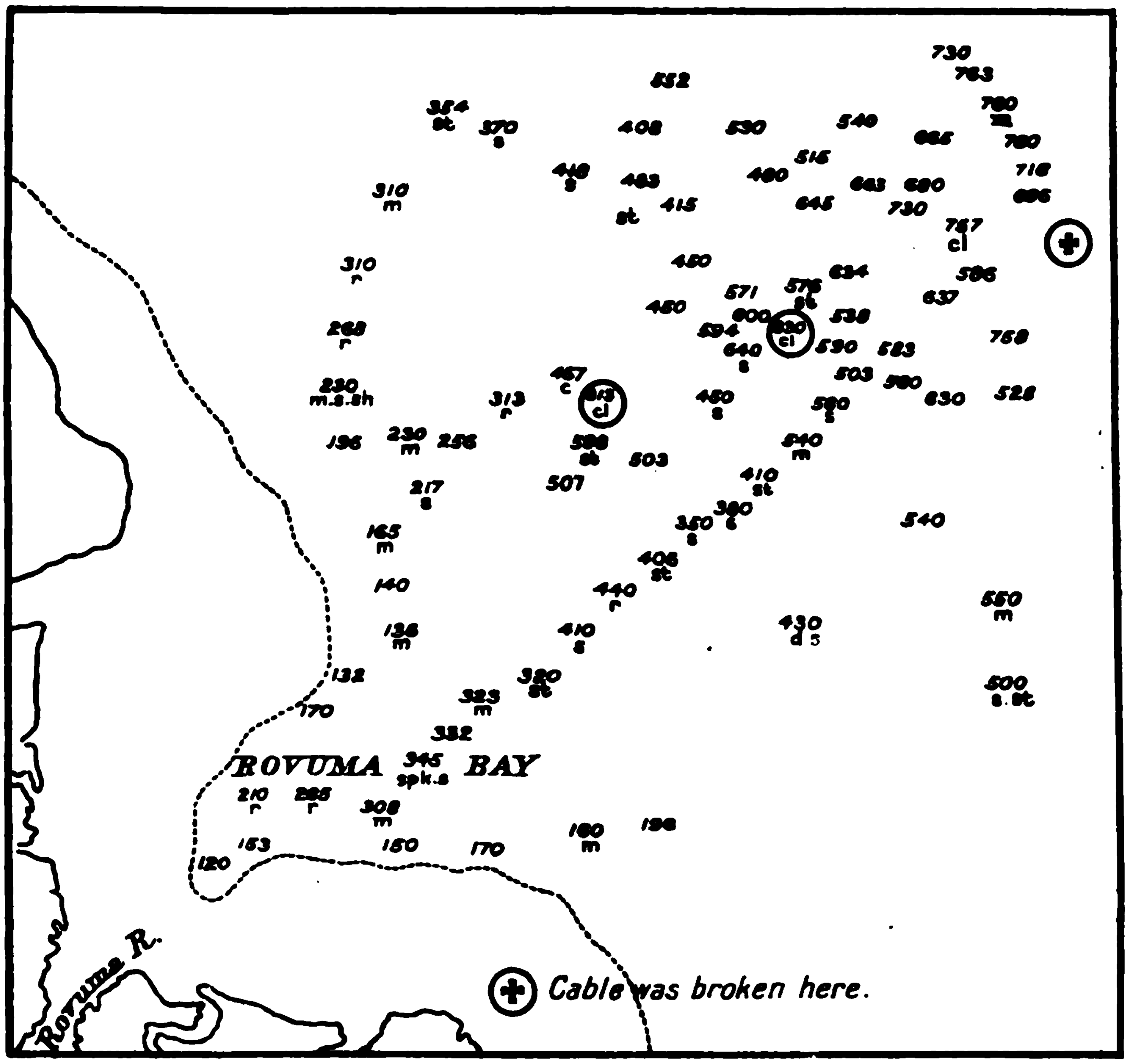


LINES OF SOUNDINGS ACROSS GULLY 14 AND 15 N M FROM CAPE VERDE, CORRESPONDING WITH TWO OF ACCOMPANYING SECTIONS.

A very remarkable phenomenon, strongly favouring the theory that a submarine river outfall now exists near to Cape Verde, was witnessed during the afternoon of April 23, 1895, in lat. 15° N., long. 17° 31′ W., 13 miles from shore. While engaged in grappling, the ship was gradually surrounded by great quantities of vegetable growth, having the appearance of river weed. There were also birds' feathers, pieces of orange-peel, whole and broken gourds, scraps of carpet, pieces of driftwood, small branches, etc., and the colour of the sea had changed to dirty brownish green. On the following morning all this had disappeared, and the sea had regained its usual tint of a pale green. The nearest surface river outlet is that of the Senegal, 75 miles distant in a north-easterly direction, and it would appear most

unlikely that such flotsam as pieces of carpet could have been carried by the coast current, which sets to the south-south-west, to so great a distance. No recurrence of this phenomenon took place during the four weeks that were spent in carrying out cable-work in the neighbourhood, nor had such a thing been noticed before, so far as records go.

If the coast current had brought these masses of weed and refuse of human habitation out of the Senegal river, it would have been a more or less constant and familiar appearance, as would also the colour of the water; but the discoloration of the sea-surface with the accompaniment above described was local, and would



ROVUMA BAY, EAST COAST OF AFRICA.

appear to be due to a sudden outburst of river-water in the vicinity and below sea-level.

While upon the subject of submarine gullies, and of the probability of their formation by river outlets, whether at or below sea-level, it may be mentioned that many subterranean rivers are supposed, with good reason, to exist. These have their outlets in some cases in the form of artesian wells.

Off Pescadores point, on the coast of Peru, and off the Rovuma river, on the East Coast of Africa, two localities widely separated, similar conditions have been met with in repairs to telegraph cables. At the latter place much trouble had been experienced with the cable between Mozambique and Zanzibar, and the

conclusion arrived at was that the cause originated in fresh water making its way to the surface from the sea-bottom, disturbing the ground and fracturing the cable.

A very remarkable instance of a river having its course underground exists to the north of Arica, a port on the coast of Peru. The bottom of the river valley consists of loose sand, no evidence of water being apparent. At a depth of some 15 feet, however, a firmer stratum of sand is found, and a continuous current of fresh water is distinctly observed as the water rapidly filters through the sand into and out of the pit. This subterranean stream is met with as a rapidly flowing river some distance inland and among the higher foothills of the great mountain ranges, but speedily disappears on entering the sandy and rainless coast region again.

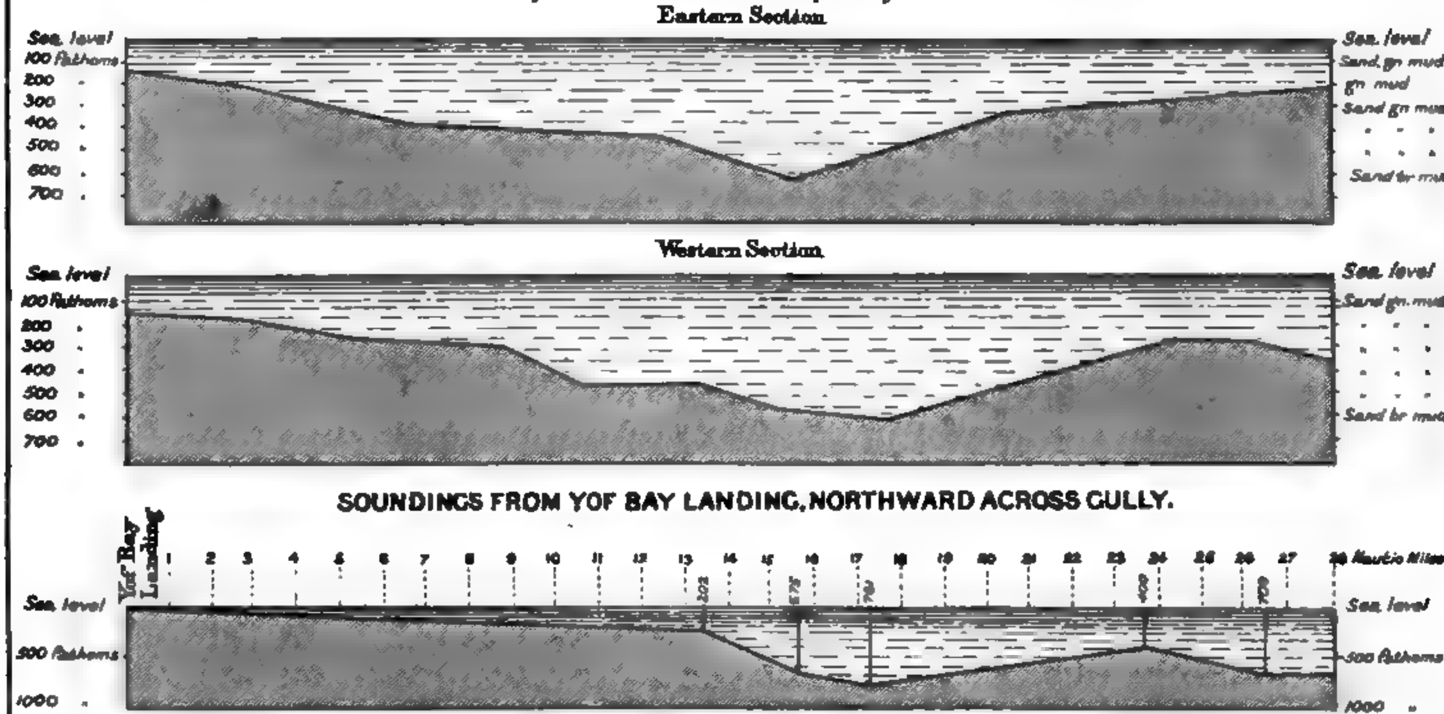
Reverting to the subject of cable repairs as being the indirect source of our knowledge of underground rivers having their outlets under the sea, a remarkable experience occurred during a repair conducted by Captain Lugar of the Central and South American Telegraph's Company steamer *Relay* to the cable connecting Payta, in Peru, with Santa Elena, in Ecuador. The fracture had been located at about 10 miles west from the small harbour of Talara, between Cape Blanco and Parina point, Northern Peru. Parenthetically, Talara at this time (April, 1891) was celebrated for the great quantities of petroleum found in the vicinity. The section of cable affected was noted for the regularity of its rupture nearly every year, about the end of March or early in April. After arriving on the "ground," Captain Lugar took a series of soundings to determine the position of the gully said to lie off this coast. He then grappled for the cable on either side, and succeeded in getting each bight to the surface without any difficulty; but, on picking up towards the fractured ends, he found the last half-knot on both sides deeply embedded in mud and clay, the wires scoured quite bright, the cable flattened in several places, and very "screwy," some of the wires broken and "rucked" up near the end, and showing unmistakable signs of having undergone great tension and considerable rough usage. The weather was fine, with light breezes and smooth water; in fact, in this locality gales are unknown, and rain seldom falls near the coast; but, beyond 50 miles inland from Talara, at times the downpour is exceedingly heavy. In repairing this cable, Captain Lugar relaid the inserted piece some considerable distance farther west, where, from the soundings obtained, he thought the cable would be fairly clear of future trouble.

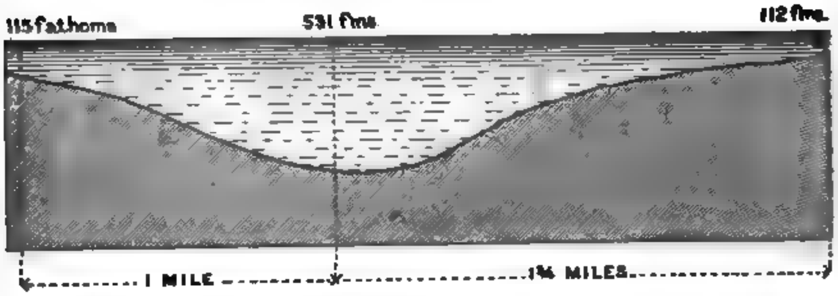
However, in the latter part of March of the following year (1892), it broke again, apparently from the same cause as in previous years, and a similar experience occurred in recovering the fractured ends. Captain Lugar devoted all the time he could spare to sounding, and traced the sides and bottom of the gully from about half a mile off the entrance of Talara harbour to about 12 miles west. It was noticed in nearly every case, that the specimen of bottom brought up from the deep part of the gully was coarse grey sand and small stones; that of the sides, a very tenacious clay; and from the comparatively level part farther away, soft green mud. The piece of cable inserted this time was laid about 3 miles to the west, in over 1000 fathoms' depth of water, with an abundance of slack, and every confidence was felt that there would be freedom from trouble in this locality for a year or two at least.

The cable ship returned to Callao on the evening of April 1, and, before coming to anchor, the captain received a message from shore, to say that the section they had just repaired was getting weak, and by the time Captain Lugar arrived at the Callao office, communication had been completely interrupted. Mr. Kingsford, the

FROFILE SECTIONS TO TRUE SCALE FOLLOWING LINES OF SOUNDINGS ACROSS GULLY AT CAPE VERDE.

These two sections of Gully are 14 and 15 nautic miles respectively from the coast near C. Verde.





SECTION TO TRUE SCALE ACROSS GULLY AT CAPE VERDE, NARROWEST PART.

company's engineer, took some tests from Chorillos, and reported the break at practically the same distance as before. It was believed that they actually found the fracture afterwards in the middle of the piece inserted a few days previously. The cable was found to be flattened near the ends, and about 400 fathoms of either side stripped to the bare wires, which were quite bright, and this had been done in less than five days. This time the inserted piece was carried seaward into about 1400 fathoms, and nearly 7 miles outside the position of the last fracture, and the section had not again, up to March, 1892, been interrupted.

Some few months later, during a conversation with one of the officials of the Talara Petroleum Company about the nature of the bottom outside their harbour, this gentleman informed Captain Lugar that a Peruvian half-caste he had employed at the wells asserted that beyond the Amatape mountains, which lie at the back of Talara, there exists a chain of lakes which has an outlet through a hole in the mountain-side, and that canoes and paddles lost on the lakes had been found on the coast between Talara and Parina point. This evidence certainly goes far towards proving the existence of a submarine river in this particular locality, and the period of the greatest outflow would appear to be in the months of March and April. Fair proof of its action has been afforded by the many interruptions to the cable laid across its outlet. These months coincide with the time of the heaviest of the rainy season in the Cordilleras and Amatape ranges.

Captain Lugar cites one other instance of a submarine outburst of fresh water which had come under his personal notice off the Dutch island of Saba, a volcanic cone 1500 feet high, 40 miles north-west of St. Kitts, in the West Indies. He visited by boat a spot in the sea about one-third of a mile from the shore on the south-west side of the island, and saw the fresh water bubbling up in small circles. He sampled some, and found it brackish to the taste. The native who guided him to the spot averred that sloops and schooners frequently filled up their barecas from this submarine stream of artesian water.

Another remarkable experience has been communicated by Captain D. Morton, who was at the time (March, 1884) in command of the West Coast of America Telegraph Company's steamer *Retriever*. During a repair to that company's cable on March 4, 1884, in 650 fathoms of water, 11 miles off Pescadores point, and while picking up towards the break, and when close to it, the cable came up completely surrounded with twigs and branches of olive trees to such an extent that they had to send men over the bows with axes to clear them away so as to allow the cable to come in over the bow-sheave. On continuing to pick up, the cable parted under great strain, the end being, no doubt, buried.

The Ocoña river, 13 miles north from the position of the break, does not flow into the sea, but into a basin or lagoon a quarter of a mile from the sea, and during heavy rainstorms in the mountains this river is transformed into a torrent carrying everything with it. Rapidly pouring into the basin or lagoon, it raises the water-surface above the sea-level, and no doubt, when a certain pressure is relieved by the water in the basin or lagoon again reaching the sea-level, a subsidence of the sea-bottom takes place, carrying the bight of the cable with it, and eventually breaking it with the downward weight and pressure. The nearest river outlet flowing into the sea is the Quilca river, 50 miles east-south-east from Pescadores point. The currents on this part of the coast are variable, and, influenced by the wind, sometimes attain a rate of from 1 to $1\frac{1}{2}$ knots per hour. This cable was again interrupted near the same position on March 23, just twenty days after the previous repair.

Mr. E. W. Parsoné relates that, during some cable repairs carried out under his direction in the same region, soundings in the neighbourhood of Pescadores point, about 60 miles off Mollendo, gave very irregular depth, indicating a channel some 40 miles distant from the coast, and somewhat similar to the Bottomless Pit on the West Coast of Africa. On shore there are signs of an old river-bed, and there are lagoons in the interior. The cable at this spot was repaired many times, and abundance of slack given for all irregularities of the bottom, but still it broke; it was frequently found buried, and was got up with difficulty, bringing up with it masses of branches and trunks of trees, which had to be cut away with axes before the cable could be got inboard. These branches and boles were the remains of olive trees, which do not grow along the coast; they doubtless came from the Arequipa district, some 80 miles inland, where olive groves abound. It would appear that these remnants of vegetation had drifted with the surface river water from the interior, and had disappeared with it underground to emerge at sea by a submarine exit. To support this idea, the breaks in the cable generally occurred after freshets due to rain in the interior. The cable was eventually diverted towards the shore, and no further trouble has been experienced, which would seem to prove that the cable had been laid shoreward inside and above the submarine river outlet.

Mr. R. K. Gray has contributed some very interesting matter in connection with the theory of submarine river outlets being the cause of ruptures in telegraph cables. Mr. Gray's experience on the West Coast of Africa has been that interruptions have generally occurred about the month of March, and the opinions he has formed show very clearly several important points and identical proofs in support of the theory of submarine river outlets. For example, the latitude of the Arica river, the Congo river, and the Rovuma river are practically the same; they are situate between the tropics of Capricorn and Cancer. Well-known authorities agree that in the tropics the month of March is a rainy month, therefore it is fair to assume that heavy falls of rain take place about this period in the unknown interior of Africa and America; while on the shore-lines near where the cables have been broken, there is nothing but sand for miles around, and comparatively little rain. The rains from the interior find their way to the sea by surface rivers in some cases, and by subterranean rivers, in all probability, in others, their subterranean flow being not merely percolation through porous strata, but large volumes of water flowing through caverns and crevices in the Earth's crust. These volumes of water have their source in the mountains, and find their outlets at sea.

There are also some points connected with the depth contour-lines on the map off Cape Verde, which are worth noting. The river shown on the map of Cape

Verde point is probably a small stream fed locally, but the lagoons are created by springs from artesian water. Then, carrying the eye from these lagoons to the sounding of 230 fathoms, a crust of water-covered shore sand will have been traversed, and seaward of the 230-fathoms spot there is the head of a large gully. That gully, by the formation in its neighbourhood, could never have been formed by a surface river, because one finds 230 fathoms increasing almost precipitously to 670 and 700 fathoms. Mr. Gray believes that at about 600 fathoms from the surface, and at about 60 to 70 from the bottom, the outlet of the river will be found, and that at certain seasons, in the month of March probably, a geyser-like effect is produced.

In the last repair to the South American cable referred to at the commencement of this paper, the cable was relaid inshore, and at a higher level than the supposed outlet. On other similar occasions a like course had been adopted, notably off the Rovuma river, in the cable between Zanzibar and Mozambique. The last mentioned of these two cables broke down eight years in succession. Since it has been relaid inshore, some twelve years ago, it has never broken down, and this is doubtless due to the cable being laid shoreward of the submarine river outlet, which probably still continues to periodically throw out its *débris*. In another instance, that of the Sao Thomé-Loanda cable, after this cable had broken down twice in fifteen months, it was relaid nearer the shore, and it then lasted for five or six years.

During the month of October, 1878, the West Coast of America Telegraph Company's steamer *Retriever*, then newly out from England, under the command of the writer, repaired the section of cable between Valparaiso and La Serena, which had been interrupted since July in the preceding year. Upon referring to an abstract of the log kept at the time, it appears that on the 28th of that month the cable was grappled and brought up from a depth of 864 fathoms to the north of the break, Limari gully bearing east 8 miles distant, and that masses of water-logged branches, and roots of bushes and trees, were entangled with the cable near the end, which was much frayed out. The cable to the south of the break was raised on the 30th, the end being broken short, which would go to show that this part had been covered by detritus, thus preserving the cable intact.

On this occasion the new cable inserted was laid in deeper water to seaward, but the section, as stated by Prof. John Milne, F.R.S., in his paper on "Sub-oceanic Changes" (see the *Geographical Journal*, August, 1897), was again interrupted in August, 1880, by an earthquake, and again by a landslip in July, 1885, this landslip being presumably due to an earthquake. On the last repair in 1885, the cable was, so the writer is informed, relaid much nearer in towards the shore, and it has not broken since. The first break occurred about a year after the cable was first laid; the second, about a year and ten months after the first repair; the third, nearly five years after the second repair. Since the third repair the cable has now withstood nearly fourteen years, which fact goes a good way to support the theory that the cable had been relaid inshore of and at a less depth than the submarine outlet of the Limari river, the surface outlet of which is practically a dry bed.

The writer was told, after the repair in 1878, by people long resident at Tongoy, and well acquainted with the Limari valley, that, during floods inland in the winter season, this river rose and inundated its banks for many miles, carrying away cattle and buildings, shrubs and trees, but none of these could possibly have escaped to sea through its surface outlet.

With reference to the Chorillos-Mollendo section of the same company's system, the writer is informed by the secretary, Mr. F. L. Robinson, that this cable was

diverted inshore off Pescadores point in April, 1891, and that they have had no interruption since the deviation. It is satisfactory to see that Prof. Milne ascribes these interruptions to periodical submarine convulsions at great and unequal depths, where the channel of an extinct or subterranean river exists at 40 or 50 knots from the coast, or, "in any case, that all difficulty has ceased since the cable has been diverted to close inshore."

The Central and South American Company's officials off Point Esmeralda, in Ecuador, had a similar experience, and surmounted the difficulty by laying the cable above the supposed submarine river outlet. From all this evidence, it may be considered that the rainy season in the interiors of continents, and the existence of subterranean rivers, account for many interruptions to cables laid near to, or parallel with, coast-lines.

The writer has been favoured by Sir John Murray with a note on the composition of the material on the sea-bottom near Cape Verde, as shown by an examination of some specimens recently sent to him, one of which has been taken as typical of samples yielded by other soundings in the neighbourhood, a large proportion of minerals being present throughout. Sir John Murray says—

"The samples are evidently very similar in composition, being all dark blue muds. Only one sample was therefore examined in detail, but the percentage of carbonate of lime was determined in them all, and was found to vary from 11·33 in 1220 fathoms to 24·2 per cent. in 1080 fathoms. The following is a description of No. 30, 1210 fathoms, which may be taken as representing the composition of all the samples:—

Dark Blue Mud, coherent, clayey.

Calcium Carbonate (12·63 per cent.), consisting of the dead shells of pelagic and bottom-living foraminifera, echini spines, and coccoliths.

Residue, after removal of the carbonate of lime by weak acid (87·27 per cent.), consists of—

Minerals (35 per cent.), m. di. 0·08 mm., angular and rounded, quartz, mica, etc.

Siliceous organisms (3 per cent.), sponge spicules and diatoms.

Fine washings (49·27 per cent.), amorphous clayey matter and small indeterminable mineral particles."

Prof. Milne, in his paper upon "Sub-Oceanic Changes," published in the *Geographical Journal* for August and September, 1897, makes mention of submarine springs as tending to disturb the accumulation of loose material which covers the slopes fringing the submarine plains bounding most continents; while striking illustrations of underground streams are, he says, to be met with in many countries.

To quote further from Prof. Milne's instructive lecture delivered before the Society would be an unwarrantable repetition, but it may be said that the prominent notice he bestows on submarine disturbing actions and changes of the sea-bottom, and the discussion on the subject, in which Sir Archibald Geikie, Mr. R. K. Gray, Mr. M. H. Gray, and Admiral Sir William Wharton, took part, demonstrates the interest evoked in the minds of men competent to deal with the question. It only requires further and more complete surveys of the localities within our knowledge to place the facts beyond doubt.

The limits to which water gravitates into the earth is beyond the powers of direct observations, but, as it is known from the formation of many basins, that the strata of which they are composed reaches a thickness of from 20,000 to 30,000 feet, it is reasonable to infer that they are permeated by water to an equal depth. It would be equally reasonable to infer from this, that artesian outbursts may,

and very likely do, occur at various depths in which submarine cables are laid. At the depths below the surface of the Earth's crust mentioned, the temperature would be such as to convert water into steam. So far we have no record of violent disturbing action causing breaks to submarine cables in depths approaching 3000 fathoms, or = 18,000 feet.

In pursuing our inquiries into this subject, it is needful to try and trace back from the effect to the cause. Therefore, from the broken cable at the bottom of the sea, torn asunder by invisible and titanic force, we have two fields of speculation open to us, one is the theory of earthquakes, the other that of sub-oceanic convulsions from other causes. These may be displacements of portions of the bottom where the slopes created exceed the angle of repose; or they may be subsidences due to "caving" in of parts of the shell over cavities in the core of the Earth. The two theories are inter-related; a slight earth-tremor might be sufficient to develop a fracture where tension exists at a weak place, and open a vent for pent-up forces within. It may be that the constant action of the flowing water, and pressure thereon, forces it to work out its own destiny, and the stress in the dark places under the earth is relieved by an outbreak under the ocean.

Dr. H. R. Mill, in the 'Realm of Nature,' "On Underground Water," section 312, says, "It is estimated that one-third of the rain which falls upon the surface of the Earth in a region like Great Britain, for example, sinks into the ground, and that the greater part of it returns to the surface at a level lower than it started from."

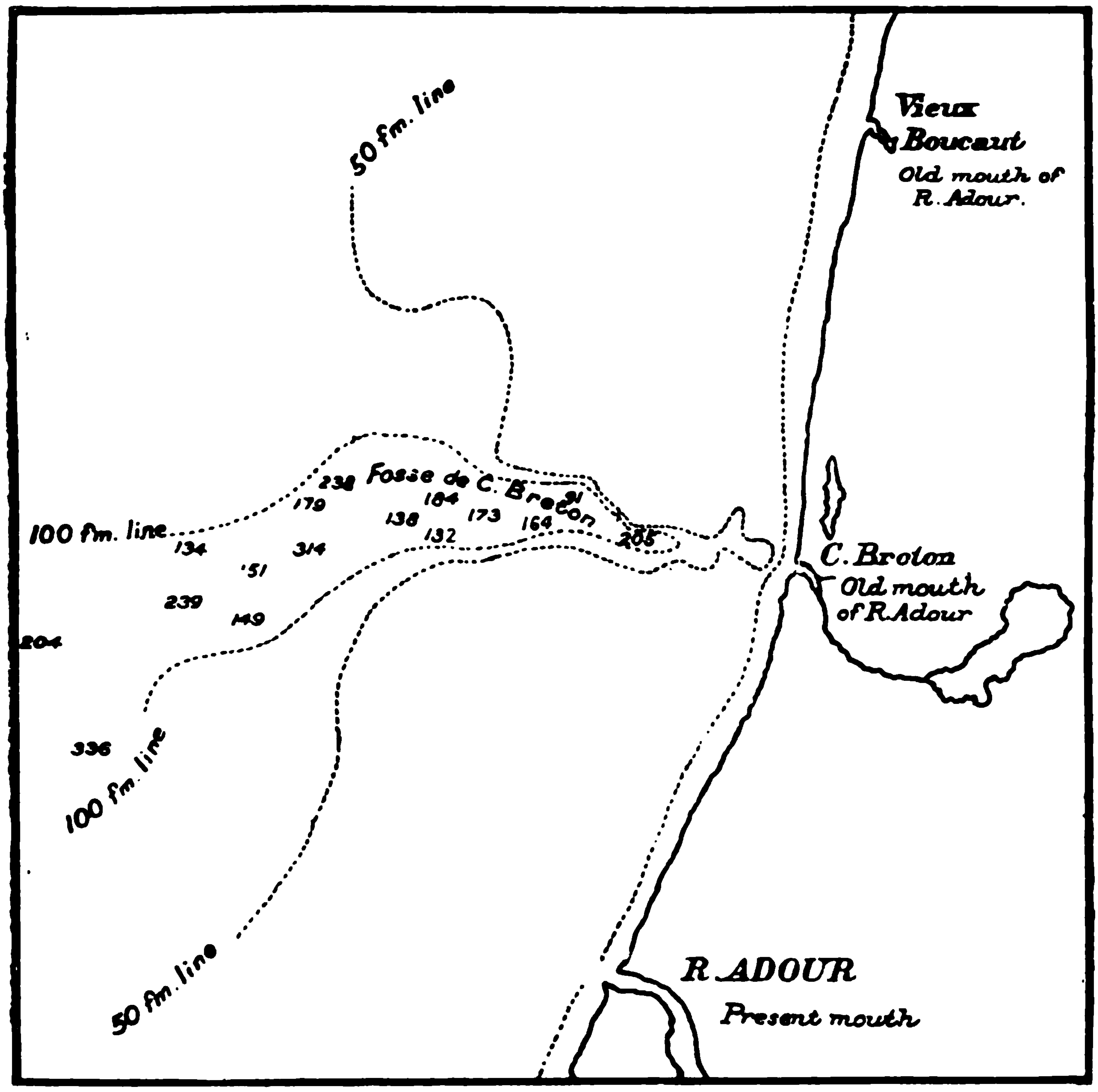
In section 317, "On Caverns," Dr. Mill makes reference to the extensive limestone caverns of Adelsburg in Austria, the Mammoth cave in Kentucky, and the Yenolan caves in New South Wales; also to the underground rivers that flow through them, and to the existence of blind fish therein. Dr. Mill says that "in all limestone regions rivers disappear beneath the surface, and although some reappear on land, several vanish altogether, and ultimately well up through the salt water of the sea, sometimes from depths of 100 fathoms or more."

"Even in the earliest antiquity," as is remarked by M. Martel in his deeply interesting lecture on Speleology during the Sixth Geographical Congress in London in 1895, "springs, caves, and underground rivers always excited human curiosity."

Many caves are without visible communication with the external world, and the entrance to others concealed by rocks in solitary ravines on hill slopes or steep sea-shores. It may thus be inferred that a vast number of caves and underground river outlets must still be totally unknown. As the streams that flow on the surface of the Earth alter their course in the lapse of time, so also are the subterranean waters active in excavating new channels and finding at length fresh outlets on a lower level. The Adelsberg cave is a remarkable instance of the changes that subterranean waters, aided by time or by the disruptive power of earthquakes, may bring about.

M. Martel, in his address to the Sixth Geographical Congress in London in 1895, modestly says that he was lucky enough to discover, from 1888 to 1894, by means of quite a new method of cave-hunting, grottoes miles in length, hung with enormous stalactites; underground rivers, never yet traced; subterranean lakes overhung with a sparkling canopy of crystallization—a whole world, dark and hidden, transformed into fairy palaces under the magnesium light. These wonders are in the region of the Causses in Southern France, which forms the southern slope of the central plateau; and the western declivity of the Cévennes, a genuine limestone tableland built up during the second geological epoch, at the bottom of the Jurassic sea, to the thickness of more than 1600 feet by the accumulation of grains of sand and organic remains.

It would be beyond the scope of this paper to make lengthy reference to this elaborate history of these explorations, although the temptation to enlarge upon the subject is keen. Imagine such a subterranean river as that of Bramabiau, in the department of the Gard, France, with its seven cascades, its tributaries of Le Bonheur, de la Trouche, and La Riviere du Sud, with its four miles of galleries, great halls, basins, tunnels, fissures, avens, or swallow-holes, and ramifications of bewildering extent. Then the subterranean river of Padirac, 2 miles long, at a depth below the plateau du Causses de Gramat of 350 metres, and only think that such discoveries may yet be made as may probably outdo these in extent,



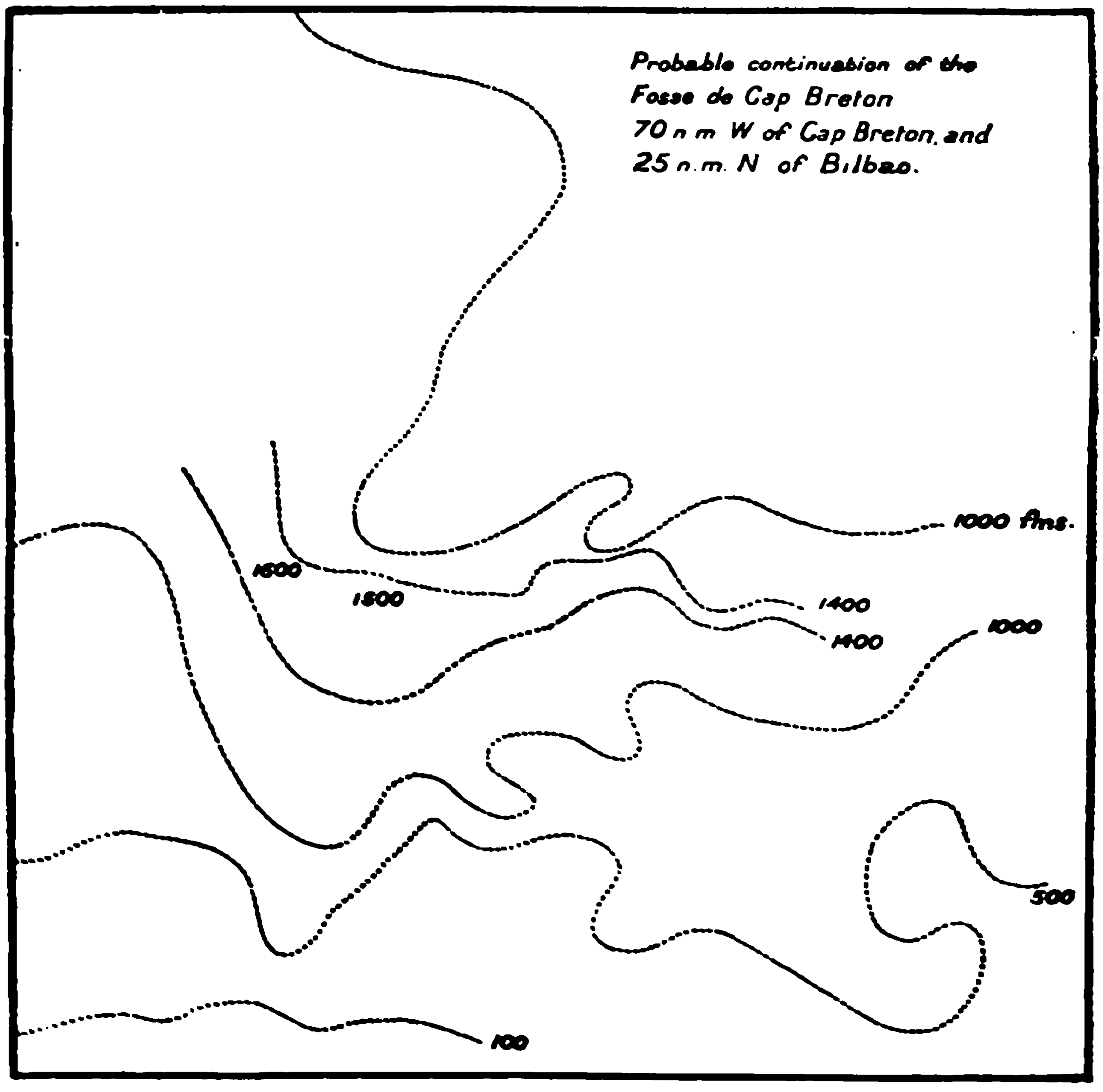
FOSSE DE CAP BRETON.

then it will not be wondered at that submarine outbursts of pent-up waters occur below sea-level.

As will be seen from these references to M. Martel's experiences, France in its continental features presents unrivalled testimony of magnificent geological changes, not only underground, extending over the immense area of the Causses, and in the departments of the Gard and the Vaucluse, but upon her coasts, the western sea-board exhibiting some most striking alterations.

There is a remarkable gully formation to the north of Bayonne, called the Fosse de Cap Breton, near to and coincident with the geological boundary between the regions of the Pyrenees and the Landes; the contour of this gully is shown on the

Admiralty charts of the date of 1887. In the fourteenth century the mouth of the Adour river existed here, and prior to that period Cap Breton was an important seaport, which gave its name to the island of Cap Breton, in North America.* The first change in the course of the river took place towards the close of the fourteenth century, during a violent storm which threw up a bar effectually blocking its outlet, the river then flowing along the rear of the dunes as far as the hamlet of Vieux Boucaut, an old mouth 22 miles north of Bayonne. The present



CONTINUATION OF THE FOSSE DE CAP BRETON.

channel of the river at Bayonne was excavated by human agency, aided by a great flood in 1571.*

It will be noticed that a large lake (L'Etang d'Ossegor) is situated to the north of Cap Breton, and another, a larger one, farther inland to the east. That the waters of these lakes communicate with the sea through the permeable sands at the old mouth of the river Adour there can be no doubt whatever, and it is extremely probable that a flow of sediment, forming a slow but irresistible avalanche, makes its way through the Fosse, which is the old river-bed, to a considerable distance out to sea.

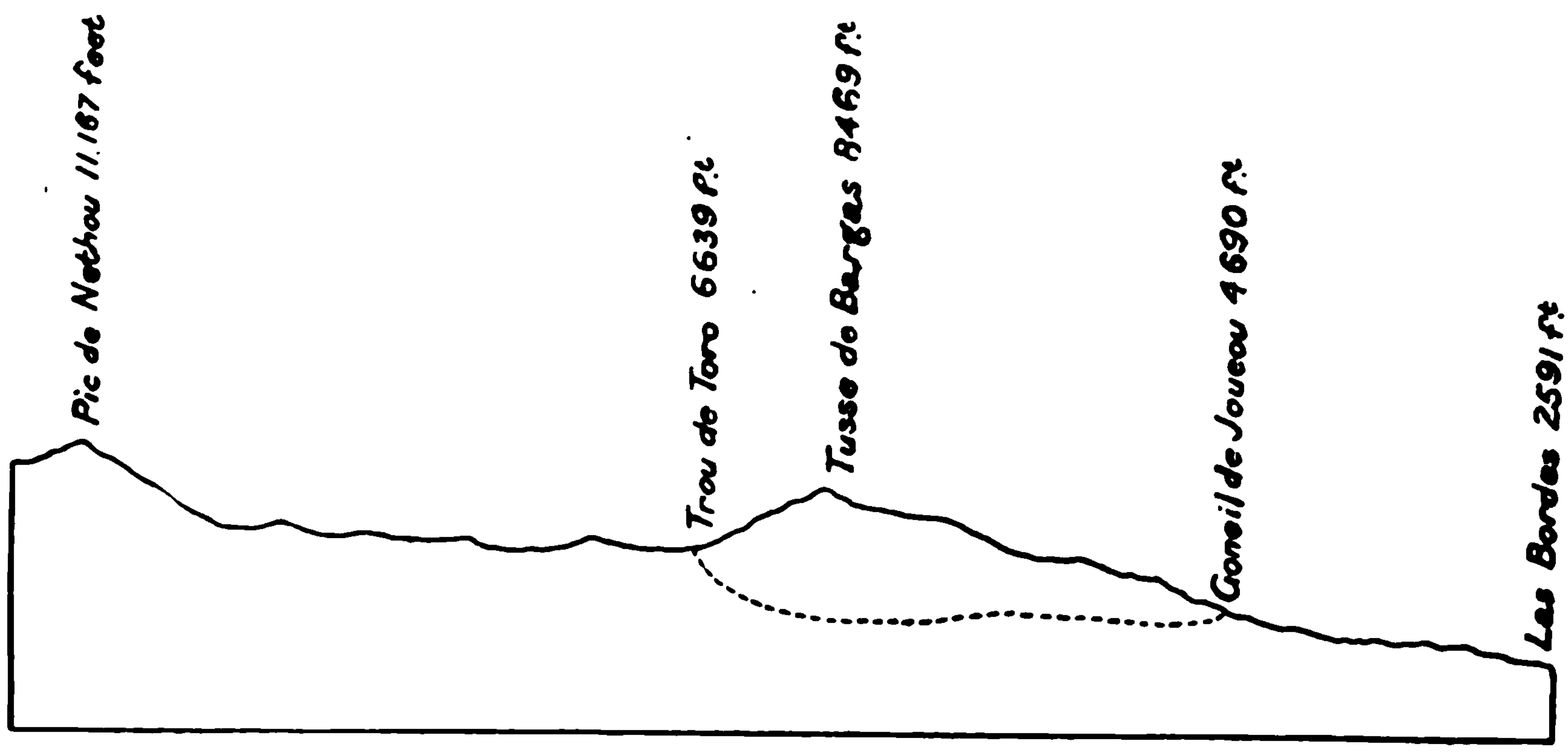
The frequent breaks to the Bilbao Lizard cable of the Direct Spanish Telegraph

* Reclus, Nouvelle Géographie Universelle, p. 112.

Company during several years after it was laid in 1872, at a position right in line to the westward of this submarine gully, may have been caused by this movement of mud and detritus, aided by the " resaca " of great waves, and the heaping up of water in the bay during westerly gales.

North of Cap Breton to the 44th parallel along the coast of the Landes are several extensive lakes, as shown by the Admiralty charts, all having communication with the sea at the surface. Two of these, L'Étang de Biscarosse L'Étang de Cazan et de Sanguinet, are connected, apparently by a canal, and find an outlet by Mimizan. All of these outlets are small, and would appear to be inadequate to carry away into the sea the surplus of water which flows into these lakes from inland sources.

The lines of soundings off the coast are uniformly similar, and show no exceptionally deep ruts off these outlets that would indicate scour. The inference would be that much of these waters find their escape farther out at depths below sea-level, probably outside the 100-fathom line.



Natural Scale 1:150000.
Scale of Miles
0 1 2 3 4 5.

THE SUBTERRANEAN COURSE OF THE GARONNE.

The river Garonne, which rises on Spanish soil, on the steep slopes of the Pyrenees, and has a head-stream fed by the snow and ice of the Pic Nethou, is swallowed up by a sink-hole known as the Trou de Taureau (" Bulls' hole "), and after a subterranean course of 2½ miles reappears again as a gushing spring at the Goueil de Joueou (" God's eye "), at the hill of Castellon. This head-stream of the Garonne is joined by a second river of that name which traverses the Spanish valley of Aran, and when it enters French territory at the defile of St. Béat it is already a formidable river.*

Between the 44th and 46th parallels, and north of the Bassin d'Arcachon are a chain of small lakes leading into l'Étang de Lacanau ; a few miles north of this is L'Étang de Carcans et d'Hourtin, a lake of considerable extent with no visible outlet to the sea. The soundings off the coast here also are uniform, and give no indication of scour due to surface outlet.

* Reclus, p. 111.

The river Touvre, a tributary of the Charente, flows for a considerable portion of its course through subterranean channels. This river is fed by the Tardoue and the Bandiat, both of which take their rise on the granite plateau of Central France, and the bulk of the water from these two rivers in turn likewise finds its way through a fissured and cavernous region into the Touvre. From these known instances, it is more than probable that the whole region of the department of the Charente and the Landes, to the Basses Pyrenees, present similar subterranean features to those so graphically set forth by M. Martel in 'Les Abimes.'

The geological agencies which have severed Cornwall from ancient Armorica, and have reduced Brittany to its existing dimensions, have been likewise active along the coast from the Loire to the Gironde.

> "In the Neolithic age,
> When the prehistoric spring made the piled Biscayan ice-pack split and shove . . .
> Straight on the glittering ice-field by the caves of the lost Dordogne."
>
> KIPLING.

The Loiret, which joins the Loire below Orleans, is fed by the Loire itself through subterranean channels.

The James Forrest Lecture, "On the Relation of Geology to Engineering," delivered by Prof. Boyd Dawkins, F.R.S., before the Institution of Civil Engineers in March, 1898 (see *Min. of Proc.*, Oct., 1898, vol. cxxxiv.), is replete in the first part with information of deep interest in connection with this subject. To quote from the address would be inadequate. It should be read through. Suffice it now to say that it will be found we have not far to go for instances of submarine outbursts of fresh water. In the course of a survey of the estuary of the Humber for a projected tunnel, vast volumes of clear water were noted rising like the head of a column in the muddy tidal waters between Barton and Hessle, known locally as the Hessle Whelps, and we find that in eastern Kent "the babbling streams and tinkling brooks" gushing out of fissures in the foreshore of St. Margaret's yield many million gallons per day, and in Dover harbour fresh water rises up below the sea-line in great volumes.

In pushing inquiry into this subject farther afield, it is found that the antipodes presents some very important features, South Australia taking a foremost place in the extent of its artesian areas. A recent geological examination by Mr. H. Y. L. Brown, the Government geologist, shows a large area of the colony to embrace a wide cretaceous basin extending from the Queensland and New South Wales borders to the outcrop of bedrock near Farina, the limits on the north and west being undefined, but, as far as can be ascertained, embracing an area of nearly 100,000 square miles. The river system of this part of the island continent is unique. Taking the Murray, for example, there are evidences at many places along its course of disappearances of vast bodies of water by percolation. Between Albany and Howlong gaugings show a loss equal to 0·144 foot per day in 40 miles. Evaporation is believed to account for 0·041 foot per day, leaving 0·130 foot per day for loss by leakage, this being equal to more than five million gallons per day. During the same year that the Murray at Mildura discharged but 10 per cent. of the rainfall in the watershed of Echuca, higher up the stream it discharged 20 per cent. of the measured fall. This shows filtration on a large scale. The same remarkable diversion of their waters underground applies to most of the Australian rivers. There is a smaller proportion of the rainfall accounted for by visible bodies of water in them than in the rivers of any other part of the world.

Mr. R. L. Jack, and a Fellow of the Society, in his paper on "Artesian Waters in the Western Interior of Queensland" (*Geological Survey Bulletin*, No.

1, Brisbane, 1895), gives the name of bibulous Blythesdale Braystone to an absorbent sandstone found at the base of the Lower Cretaceous formation at Blythesdale, near Roma. This braystone outcrop is crossed by several large streams and the eastern tributaries of the Thomson river, and while the waters are running the bibulous rocks are absorbing them greedily; not only does the water spread laterally, but it fills up the underground portion of the strata that has been emptied by leakage. It is supposed, and believed to be actually the case, that the outcrop of these beds occurs at gradually lower levels until it attains the sea-level, and it is also supposed that the beds dip seaward, and beneath the sea, and either dip at a lower angle than the slope, or rise to the lower level of the ocean-bed. Evidence that leakage of this kind has actually taken place was presented by Prof. David, who, in November, 1893, described powerful springs of fresh water at Port Macdonnell, rising up from the floor of the ocean, and discolouring the water for some distance around.

In other regions of the Eastern Hemisphere the river systems are distinguished by exceptional characteristics. Take the Malabar and Coromandel coasts, for example. The rivers of Malabar, excepting the Ponani, which rises on the east of the Anamalate hills, have but short courses, and reach the sea through independent channels, but farther south they discharge into riverain lagoons, known as backwaters. In many places these lagoons are disposed in two or three or more lines parallel with the coast, and the whole seaboard appears to have been formed by beaches successively deposited by the sea, and then separated from each other by shallows, where the salt water has been gradually replaced by fresh water.

The aspect of the surface waters goes to show that from some cause, probably artesian, considerable disturbances take place on the bed of the sea along the Coromandel, Ceylon, and Malabar coasts. At several points stretches of muddy water, coloured yellow or red, have been seen, even in great depths. The waves break around the edges of these spaces, within which the surface always remains smooth, or slightly disturbed in an undulating form. Vessels take refuge on these patches, which also form favourite feeding and spawning grounds for multitudes of fish. No marine region deserves more careful study than these turbid islands, encircled by clean water; they seem to teem with myriads of animalculæ, changing the liquid element to the consistency of mud.*

Pondicherry, it may be here remarked, is now supplied with good water from artesian wells sunk to depths of hundreds of feet.

While studying the views of one of the New South Wales authorities before cited, the writer was struck with one or two very interesting items of information, which would appear to be intimately related with the subject under consideration.

It is shown that the hottest region on Earth exists in the Eastern Hemisphere. This region borders on the Persian gulf, and is on the south-west coast of Persia. The thermometer, during July and August, never falls below 100° *during the night*, while in daytime it rises to 120° or 130°. Little or no rain falls, and yet, in spite of this terrific heat, a comparatively numerous population contrive to live, slaking their thirst from the copious springs of fresh water which burst forth from the *bottom of the sea*. These supplies can only be derived from rain-water which has sunk into a porous stratum some distance inland, and discharges itself at a point where it meets an insufficient retaining pressure, and which, in this case, would appear to be at an outcrop of the porous stratum in the ocean-bed.

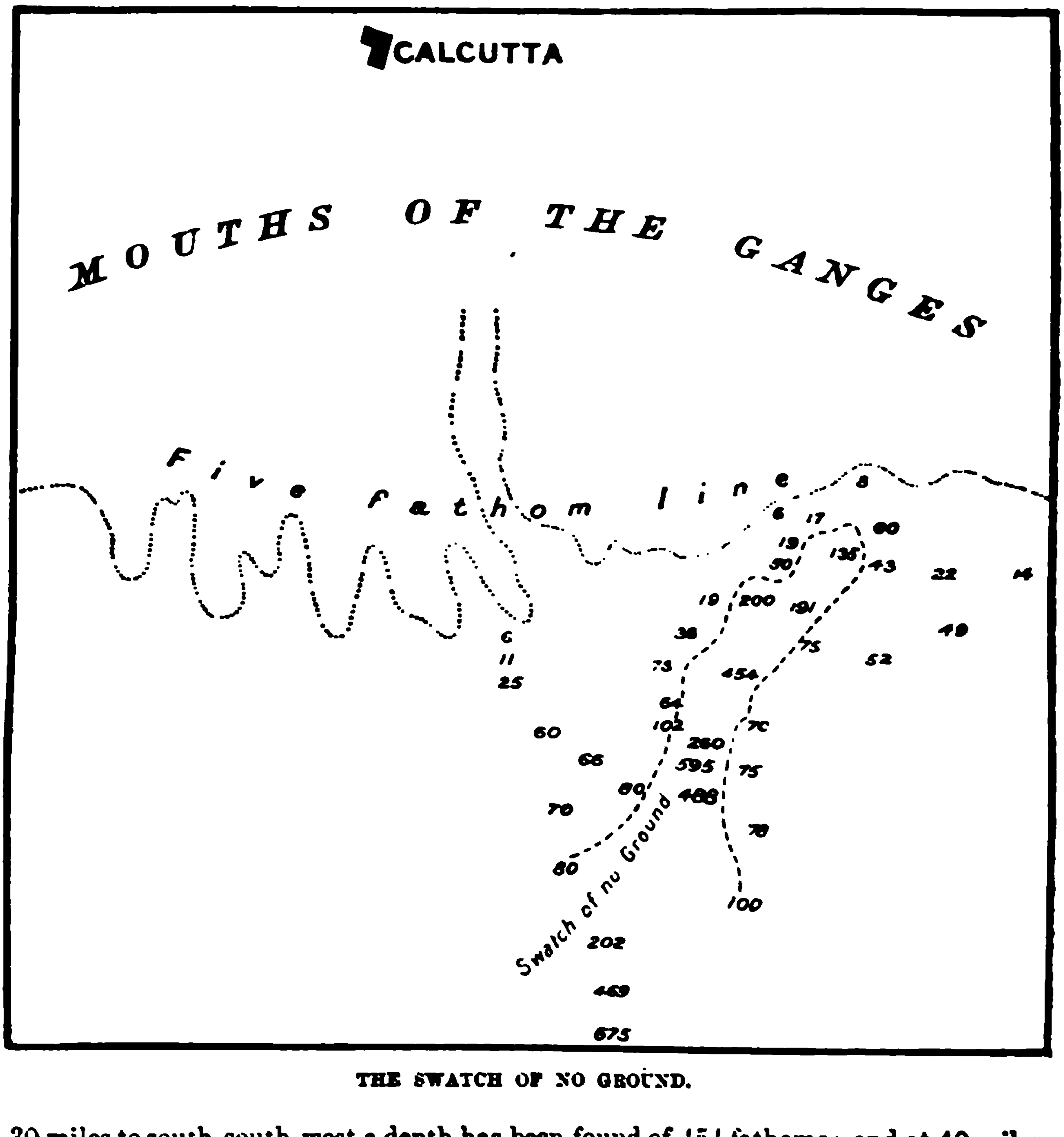
The Nubian desert takes more than equal rank in point of warmth of climate.

---

* Reclus, vol. viii. p. 531.

Here food may be cooked by being buried in the sand. The Arabs say of it, "The soil is like fire, and the wind is like a flame." This desert, however, will, it is said, undergo a great change under the influence of British colonisation and the artesian borer's drill; it will vie with the great Sahara in its wonderful transformation since the advent of its artesian water-supplies.

At the estuary of the Ganges, south of the Murgattah and Bangarah rivers, is a singular submarine gully depression, from 6 to 12 miles broad, called the "Swatch of no ground," the north part being in latitude 21° 24′ N. Here the depth suddenly drops from 20 fathoms to 135 fathoms; and at about

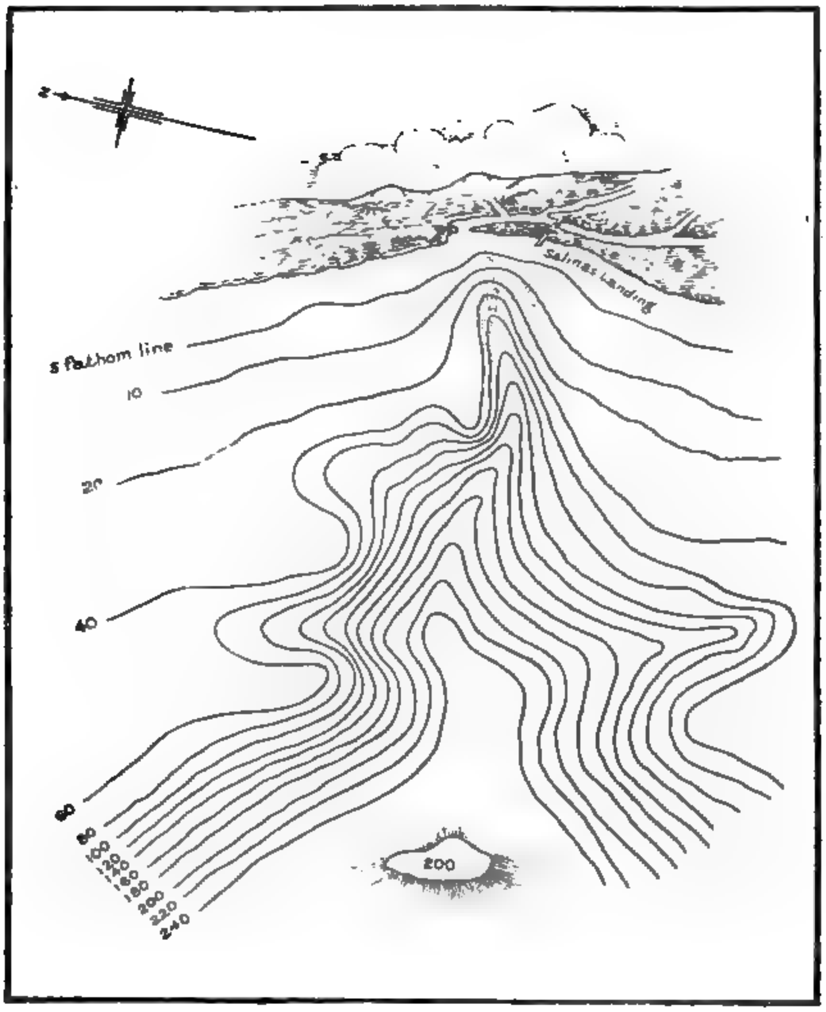


THE SWATCH OF NO GROUND.

30 miles to south-south-west a depth has been found of 454 fathoms; and at 40 miles, of 595 fathoms. Two miles north of this greatest depth is a sounding of 260 fathoms, which shows an elevation of 2010 feet in the ocean floor, and the very steep grade of 30°. Six miles to the south-eastward of that sounding is found a depth of 488 fathoms, or an elevation of 642 feet. Another similar remarkable feature, about 30 miles to the south of the 595 fathoms' sounding, is a depth of 202 fathoms, with 469 fathoms and 675 fathoms at 8 and 12 miles distant respectively. No indication of the character of the bottom is given on the Admiralty chart. This is to be regretted, because it leaves in doubt a very important point as to whether

these elevations, both inside and outside this very curious gully, are of hard mud or rock.

Mr. J. Y. Buchanan, F.R.S., has pointed out, in speaking of the Congo, that all marine muds settle down in a state of very considerable consistency, so that it is quite likely that these elevations are mounds of mud which have been deposited by



SALINAS LANDING, MONTEREY BAY, CALIFORNIA. CONTOUR OF SEA BOTTOM.

the centripetal motion of the eddies occurring in the tidal waters at certain spots. Captain Ritchie, an old author who surveyed the surface of the Sunderbunds, says of the low islands lying on the outer edge of the Ganges river outlets, that the bank proper is cut through and channels are formed, that these channels have no definite trend, and that they all offer safe ground for anchorage, with an increasing

depth of water *towards the land.* The nature of the ground in the channels is soft towards the shores, but the ground will suddenly be found hard and in terraces as the depth decreases. There is evidently a scour through the "Swatch" that keeps it from filling up with the sediment brought down in such vast masses by the surface river outlets, and it is possible that it is the ancient bed of the river which existed before the formation of the multitude of islands through which the river passes by its many channels.

In the report of Results of a Hydrographic Survey undertaken by the U.S. Government in 1891–92, for a submarine cable route between California and the Hawaiian islands, a remarkable gully formation was discovered at the Salinas landing in Monterey bay, California. An illustration shows the bottom as it would appear when dry. The table-top mound at the mouth of the bay, which lies 200 fathoms from the ocean surface, probably indicates a former mud deposit analogous to the mud mounds found in the "Swatch" at the mouth of the Ganges.

Sir Charles Lyell, in his 'Principles of Geology,' points out that "Fissures once formed in limestone are not liable, as in many formations, to become closed up by impervious clayey matter, and hence a stream of acidulous water might for ages obtain a free and unobstructed passage. . . .

"When a mass of cavernous rock is raised above the sea-level, it will usually be intersected by rivers and valleys, and it must then happen that here and there a torrent or river will break into some cavern; accordingly engulfed streams occur in almost every region of cavernous limestone, as, for example, in the north of England. In no district are they more conspicuous than in the Morea, where the phenomena has been studied by M. Boblaye and his fellow-labourers of the French expedition to Greece. From his account, numerous caverns are there found in a compact limestone of the age of English chalk, immediately below which are arenaceous strata referred to the period of our greensand. In the more elevated district of that peninsula there are many land-locked valleys or basins closed round on all sides by mountains of fissured and cavernous limestone. The year is divided, almost as distinctly as between the tropics, into a rainy season which lasts upwards of four months, and a season of drought of nearly eight months' duration. When the torrents are swollen by rains, they rush from surrounding heights into enclosed basins, but instead of giving rise to lakes, as would be the case in most other countries, they are received into gulfs or chasms, called by the Greeks 'Katavothra,' and which correspond to what are termed 'swallow-holes' in the north of England. All the waters of these torrents of the Morea are turbid where they are engulfed, but when they come out again, often at the distance of many leagues, they are perfectly clear and limpid. The points of efflux are usually near the sea-shores of the Morea; but sometimes they are submarine, and when this is the case the sands are seen to boil up for a considerable space, and the surface of the sea, in calm weather, swells in large convex waves."

The great geologist says, in his chapter on "Imbedding of Organic Remains in Subaqueous Deposits," "There is, indeed, no circumstance which so seriously impedes the acquisition of just views in our science as an habitual disregard of the important fact that the reproductive effects of the principal agents of change are confined to another element—to that larger portion of the habitable globe from which, by our very organization, we are almost entirely excluded."

In conclusion, I may say that in my reference to underground rivers, artesian waters, and submarine springs in various parts of the world, I have necessarily omitted mention of much interesting matter.

An account of the lost rivers, sink-holes, etc., that abound in North America;

the caverns of the Ohio valley, and of Canada; the underground cavities and waters of some of the West India islands and Brazil, would alone form a voluminous paper. In England and Ireland the investigations of Professors Boyd Dawkins and Edward Hull have, amongst others, disclosed caves, swallow-holes, and other evidence of subterranean waters whose existence was previously ignored.

In this paper readers may notice some apparent contradictions. These arise through my desire to place before the Society, not only my own views, but also those of many whose opinion I consider worthy of mention. I have recorded these views, as I do not think that, with the small amount of evidence we have before us, any one, however distinguished, can claim a perfect knowledge of the causes at work. We are only on the threshold of the subject, and I hope that the data I have been able to collect and lay before my readers will set the thinking minds at work, and produce an effect which may prove beneficial to the knowledge we possess of the world in which our lot is cast.

THE ANTARCTIC CLIMATE.

By HENRY ARĄTOWSKI.

THE following is a preliminary account of some of the additions to our knowledge of the meteorology of higher southern latitudes contributed by the recent Belgian Antarctic Expedition.

These desolate antarctic regions, still so little explored, present many physical problems of the highest interest; the question of their climate, attacked as early as the time of Croll, must prove a subject of exhaustive investigation in the immediate future. The results I have obtained were not originally intended for publication in their present form, because the mean values involved can only be regarded as first approximations; however, it appears that my provisional numbers are sufficiently exact to indicate the general nature of the climatic *regime* in parts of the globe about which we have been, up to the present, practically without information. The fact that other antarctic expeditions are about to set out has decided me to publish my figures as they stand.

For the purposes of our inquiry, it is a matter of indifference whether an antarctic continent exists or not; we have undoubtedly to deal with a continuous surface of ice, which the meteorologist must regard as a land surface as opposed to an open sea. This ice-cap is entirely isolated by an ocean which surrounds it, and is subjected to the peculiar conditions of polar day and night. Hence the first points to be considered are the average distribution of pressure, and the direction of the prevailing winds. The positions (about 81° and 95° W. long., and 69° 50′ and 71° 30′ S. lat.) show a relatively small distance from the open sea and great distance from the pole. In consequence we experienced two distinct types of climate according to the direction of the wind—a continental and an oceanic—in effect a coastal climate depending on the passage of cyclones which varied in frequency with the seasons. This seems to be the key of the whole position. As regards details, I take into consideration the mean and minimum temperatures and the barometric pressures, the direction of wind, the amount of cloud, and the amount of precipitation.

Table I. gives the mean values obtained from hourly observations of temperature made on board the *Belgica* during her drift in the ice.

July was the coldest month; its mean temperature was $-23^{\circ}\cdot5$ C. ($-10^{\circ}\cdot3$ F.), and the lowest temperature observed during the month, $-37^{\circ}\cdot1$ C. ($-34^{\circ}\cdot8$ F.).

The extreme minimum of temperature was observed in September, $-43^\circ{\cdot}1$ C. ($-45^\circ{\cdot}6$ F.).

The warmest month was February, with a mean temperature of $-1^\circ{\cdot}0$ C. ($30^\circ{\cdot}2$ F.), and minimum for the month, $-9^\circ{\cdot}6$ C. ($14^\circ{\cdot}7$ F.).

If we regard June, July, and August as the antarctic winter months, and December, January, and February as summer, we may take it that the mean winter temperature is $-16^\circ{\cdot}8$ C. ($1^\circ{\cdot}8$ F.), and the mean for summer $-1^\circ{\cdot}5$ C. ($29^\circ{\cdot}3$ F.).

Table II. shows the minimum temperature for each month. The maximum temperatures are less interesting; the winter average is -1° to 0° C. (30° to 32° F.); the absolute maximum for the equinoctial months is 0° to 1° C. (32° to 34° F.), and for summer 2° C. (36° F.).

These tables show that between the seventieth and seventy-first parallels of the southern hemisphere, and amid the ice of the antarctic ocean—first, the mean temperature is lower than that of the northern coast of Spitsbergen (Mossel bay, 1872–73, $-8^\circ{\cdot}9$ C. (16° F.)); second, the minimum temperature is quite as low as the minima observed on the east side of Greenland (Sabine island and Scoresby sound); and third, that the mean temperature of the three summer months is lower than the corresponding mean in the ice of the arctic ocean—the observations of the *Fram* give a mean for June, July, and August of $-1^\circ{\cdot}2$ C. (29° 8 F.). Note that the calculations of Spitaler and Supan give a mean temperature for the parallel of 70° N. lat. of $-10^\circ{\cdot}2$ C. ($13^\circ{\cdot}6$ F.). If we consider that a considerable fraction of the seventieth parallel of south latitude is land, we can suppose that it may have a mean temperature as low as the 70° N., and include a pole of cold with lower temperature as the Asiatic or North American poles of cold.

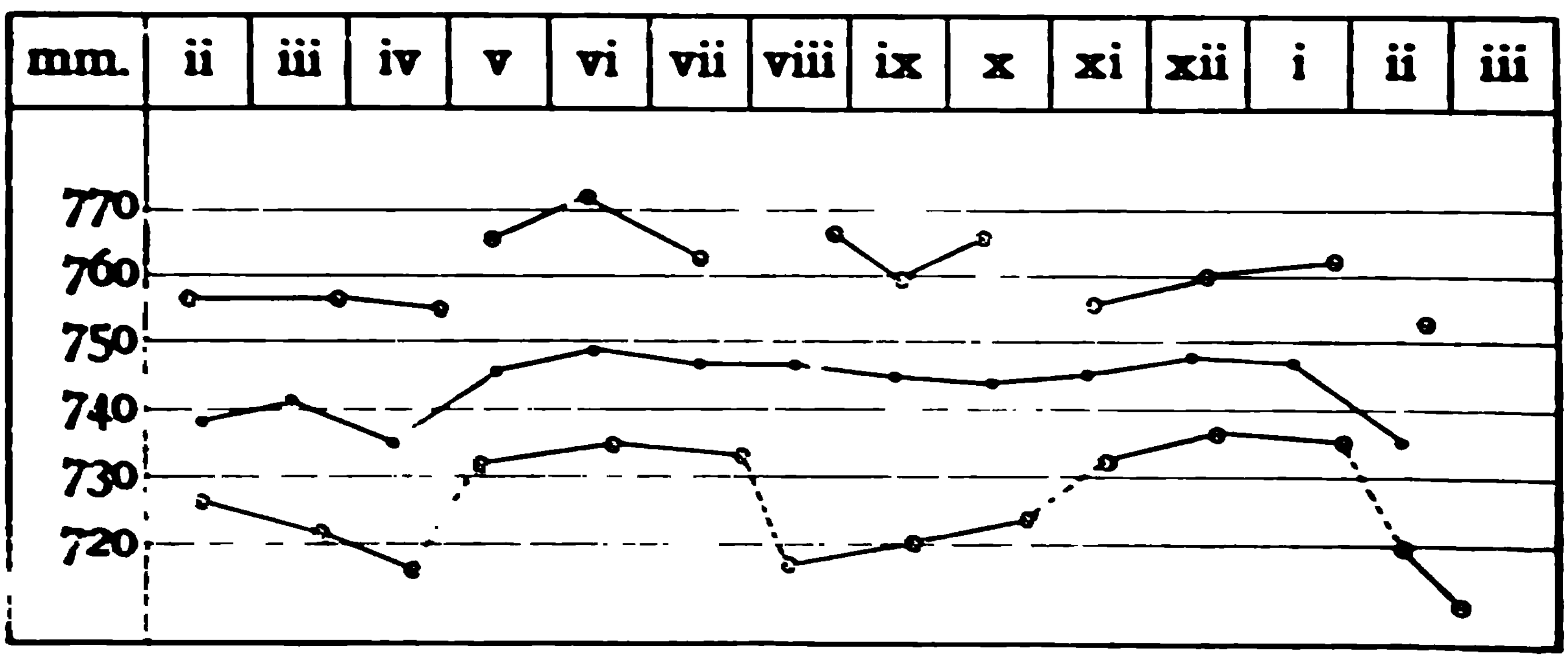


FIG. 1.

As in the case of the mean temperatures, the values I am able to give for mean barometric pressure must be regarded only as first approximations. During our drift in the pack-ice hourly observations were made with a marine barometer and with an aneroid. I have not yet been able to apply exact corrections to these observations, but if we bear in mind that while the temperature correction is negative, the correction for latitude is positive, and that for temperatures about 13° to 15° C. (55° to 60° F.), these corrections are numerically nearly equal, we can accept the uncorrected values as near enough for our present purpose. Table III. gives the averages of the aneroid observations, calculated to whole millimetres only. The mean for the year is 744·7 mm. (29·319 inches).

Tables IV. and V. give the principal minima and maxima of pressure observed, the values are reduced to the freezing-point and gravity at 45° lat. The lowest

pressure observed during our wintering was 711·74 mm. (28·022 inches), and the highest 772·14 mm. (30·400 inches), a range of 60·40 mm. (2·378 inches). Table VI. gives the monthly variations of the barometer, the mean value of which amounts to 34·30 mm. (1·350 inch), showing even more clearly than Table IV. that the cyclonic belt extends beyond the polar circle. From this table it appears, further, that the three months of almost continuous daylight (November, December, and January) are characterized by a very small variation of pressure—only 23·95 mm. (0·943 inch). The three corresponding months of winter have also a mean less than those for the intermediate or equinoctial months. Compare this with the mean pressures (Table III.): the differences between the annual and monthly means (Table VII.) show that February, March, and April form a negative group, in which the pressure is relatively low; the three months of polar night form another group of maximum barometric pressure; then follow August, September, and October, months of decreasing pressure, a group which, although not actually negative, forms a distinct secondary minimum; and, lastly, three months of polar day forming a secondary maximum of pressure. The general result is illustrated in Fig. 1—high pressure at the solstices, low pressure at the equinoxes—and the existence of a direct simple relation between the barometric pressure and the progress of the sun is at once obvious.

Table VIII. gives the observed wind-directions: the figures indicate the number of hours during which the wind blew from each direction during the twelve months, the sums constituting the "wind-rose," of the point of observation. Fig. 2 shows that winds blow from northerly and southerly points with almost equal frequency, and that easterly winds predominate over westerly. The directions of greatest frequency were west, east, and north-east.

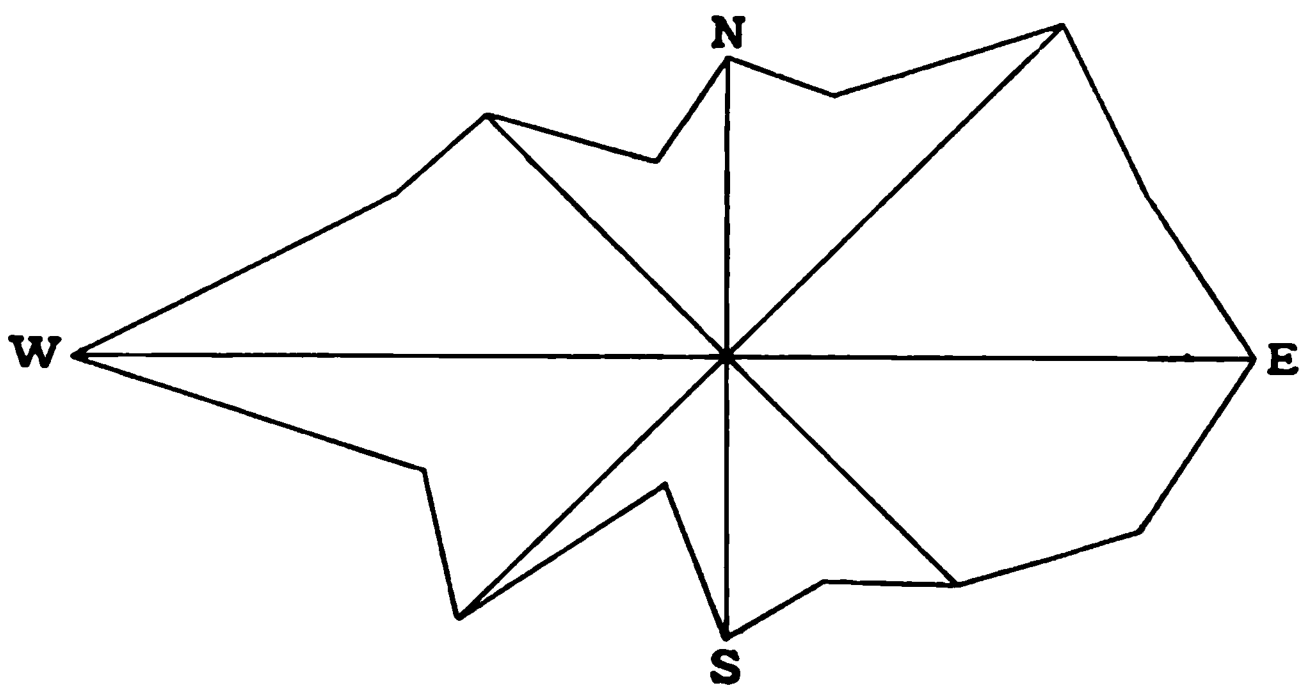


FIG. 2.

The monthly wind-roses show some interesting seasonal variations in the prevailing directions of the wind; we note specially the predominance of north-east to south-east over westerly winds from November to February, and the relative frequency of westerly winds during June, July, and August (Fig. 3). The figures show that on the whole the station was beyond the westerly wind region, although at certain seasons the westerly system did extend as far south.

Some further points must be referred to in describing the climatic conditions we experienced. The temperature of the air is doubtless the most important element in the study of climate; but it seems to me that its importance is relatively less in polar regions than in other parts of the globe. In polar latitudes the human organism is chiefly influenced by the absence of the sun during the night of winter. In the summer, on the other hand, the radiant heat of the sun is so strongly

concentrated that the temperature of the air scarcely measures the warmth we feel. Further, the action of the solar rays is directly beneficial—the sun strengthens and reanimates. And besides direct insolation, the diffused daylight itself must be considered—one feels quite different under a cloudless vault and under a sky overcast and sombre. The presence or absence of the sun is a much more important matter to us than the state of the thermometer.

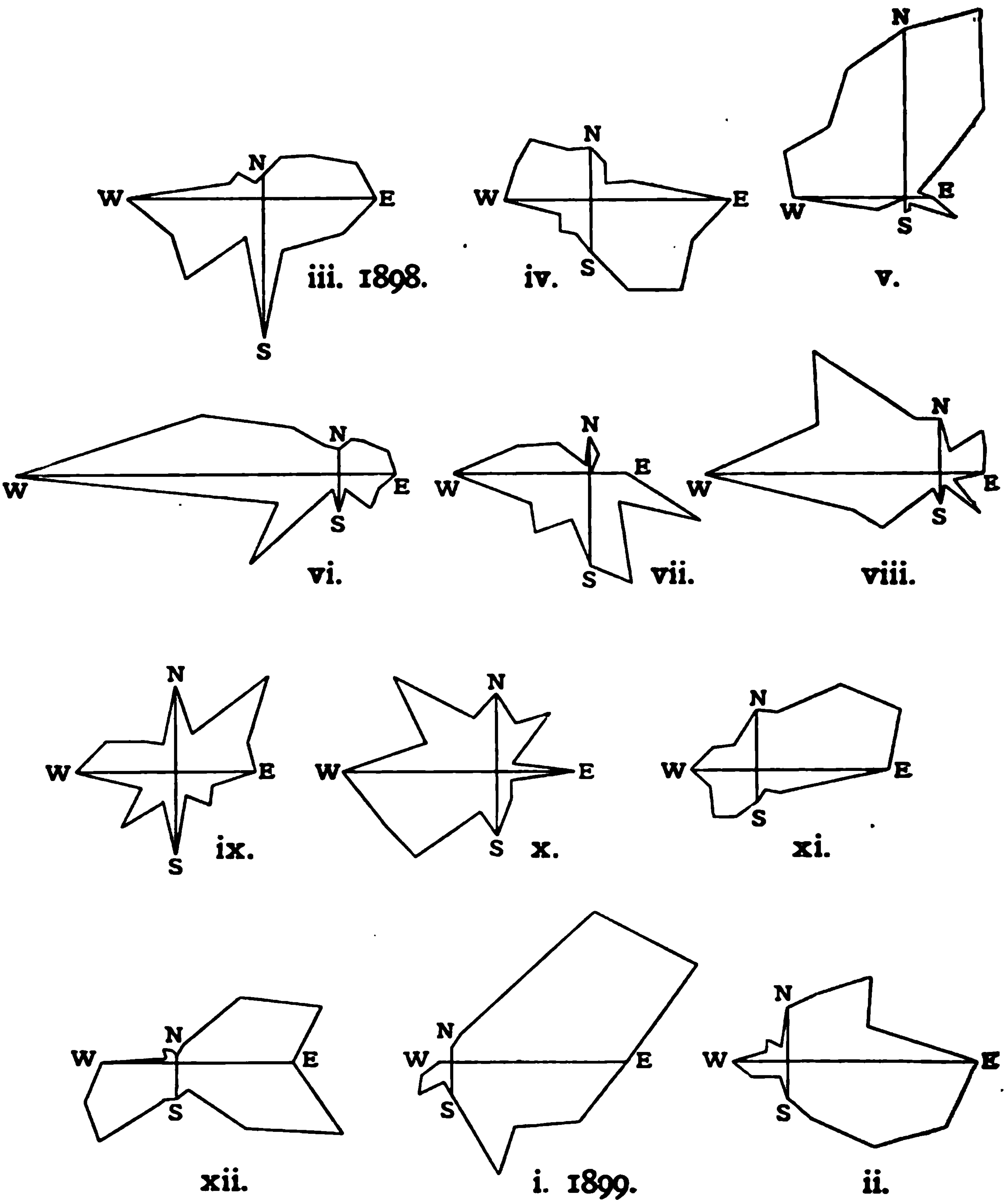


FIG. 3.

The wind is another extremely important factor from the physiological point of view. In calm weather a temperature of $-20°$ C. ($-4°$ F.) is quite tolerable, even agreeable if the sun is shining; but with a light breeze one feels the cold at once, and in strong wind it is impossible to remain long in the open air with so low a temperature. It appears to me that humidity plays a quite secondary part in the physiology of the polar climate, at least at low temperatures; in any case the humidity of the atmosphere rarely makes itself felt.

Some actinometric observations will serve to indicate the intensity of radiant heat. At 2 p.m. on December 30, the temperature of the air being −0°·2 C. (31°·6 F.), the black-bulb thermometer read 45°·1 C. (113°·2 F.) in the sun, which explains why in reality the weather felt very warm.

The sky was usually overcast, most frequently with a thick layer of stratus, which formed a uniform grey covering, and often persisted for days or even weeks together, with only short breaks. Table IX. shows the state of the sky during each month of the year.

The number of days during which the air did not remain saturated, *i.e.* on which the hygrometer indicated a humidity of less that 90 per cent., was—October, 12, November, 18; December, 22; January, 15; and February, 11.

If we include ice-deposits from fog and similar precipitation, we find that snow-fall is recorded on 257 days of the year, made up as shown on the first column of Table X. The second column of Table X. shows the number of days on which rain (even a few drops) was recorded. Speaking generally, it may be said that the weather was extremely cloudy, that fogs were frequent, that snow fell on many days, and that the air was saturated nearly the whole time.

Table XI. gives particulars with regard to wind-force.

Table I.—Mean Temperature.

	°C.		°F.	
1898. March	− 9·1		15·6	
April	−11·8	− 9·1	10·8	15·6
May	− 6·5		20·3	
June	−15·5		4·1	
July	−23·5	−16·8	−10·3	1·8
August	−11·3		11·7	
September	−18·5		− 1·3	
October	− 7·9	−11·1	17·8	12·0
November	− 6·9		19·6	
December	− 2·2		28·0	
1899. January	− 1·2	− 1·5	29·8	29·3
February	− 1·0		30·2	
Year	− 9·6		14·7	

Table II.—Monthly Minima of Temperature.

	°C.	°F.
1898. February 23, at 10 p.m.	− 7·6	18·3
March 15, at 4 a.m.	−20·3	− 4·5
April 3, at 6 p.m.	−26·5	−15·7
May 29, at 8 p.m.	−25·2	−13·4
June 3, at 6 p.m.	−30·0	−22·0
July 17, at 10 p.m.	−37·1	−34·8
August 28, at 3 a.m.	−29·6	−21·3
September 8, at 4 a.m.	−43·1	−45·6
October 25, at 3 a.m.	−26·3	−15·3
November 2, at 4 a.m.	−21·4	− 6·5
December 2, midnight	−14·5	5·9
1899. January 2, at 2 a.m.	− 8·1	17·4
February 11, at 2 a.m.	− 9·6	14·7
March 4, midnight	−12·0	10·4

TABLE III.—MONTHLY MEANS (APPROXIMATE) OF BAROMETRIC PRESSURE.

		mm.	Inches.
1898.	February *	738·5	29·075
	March	741·4	29·190
	April	735·6	28·961
	May	746·3	29·382
	June	749·5	29·508
	July	747·8	29·441
	August	747·2	29·418
	September	745·5	29·351
	October	744·7	29·319
	November	746·0	29·371
	December	748·2	29·457
1899.	January	747·3	29·422
	February	736·5	28·997
	Year	744·7	29·319

* Latter half of month only.

TABLE IV.—MINIMUM PRESSURES OBSERVED.

		Reduced to freezing-point.		Reduced to freezing-point and lat. 45°.	
		mm.	inches.	mm.	inches.
1898.	February 18, at 6 a.m. ...	724·53	28·526	725·93	28·581
	March 22, at 4 a.m....	719·96	28·345	721·48	28·405
	April 20, at 3 a.m.	714·66	28·136	716·15	28·195
	May 10, at 11 p.m.	730·26	28·751	731·78	28·811
	June 21, at 1 a.m.	733·58	28·881	735·11	28·941
	July 31, at 2 a.m.	731·77	28·811	733·28	28·870
	August 12, at 4 a.m. ...	715·81	28·182	717·31	28·241
	September 22, at 6 a.m. ...	719·29	28·319	720·77	28·377
	October 23, at 4 a.m. ...	722·06	28·428	723·53	28·486
	November 19, at 3 p.m. ...	731·33	28·793	732·82	28·852
	December 22, at 10 p.m. ...	735·52	28·958	737·01	29·016
1899.	January 30, at 10 p.m. ...	733·92	28·895	735·43	28·955
	February 17, at 11 p.m. ...	718·59	28·292	720·08	28·350
	March 2, at 3 a.m.	710·26	27·963	711·74	28·022

Absolute minimum, 711·74 = 28·022 inches.

TABLE V.—MAXIMUM PRESSURES OBSERVED.

		Reduced to freezing-point.		Reduced to freezing-point and lat. 45°.	
		mm.	inches.	mm.	inches.
1898.	February 11, at 4 p.m.	755·82	29·757	757·11	29·808
	March 29, at 1 a.m. ...	755·35	29·739	756·95	29·802
	April 26, at 7 a.m. ...	753·80	29·678	755·37	29·739
	May 13, at 4 p.m. ...	764·28	30·090	765·90	30·154
	June 11, at 1 a.m. ...	770·48	30·334	772·14	30·400
	July 18, at 8 p.m. ...	761·53	29·983	763·10	30·044
	August 29, at 6 p.m. ...	765·43	30·135	766·99	30·197
	September 16, at 9 p.m.	757·77	29·834	759·31	29·894
	October 12, at 8 a.m. ...	764·80	30·111	766·35	30·172
	November 13, at 4 a.m.	754·05	29·688	755·58	29·748
	December 18, at 5 a.m.	757·65	29·829	759·20	29·890
1899.	January 24, at 8 p.m. ...	760·76	29·951	762·33	30·013
	February 22, at 3 a.m....	751·63	29·593	753·17	29·653

Absolute maximum, 772·14 mm. = 30·400 inches.

TABLE VI.—MAXIMUM VARIATIONS OF PRESSURE, AND MEANS OF THOSE VARIATIONS.

	mm.		inch.
1899. February	33·09		1·303
1898. March	35·47	35·93	1·397
April	39·22		1·544
May	34·12		1·343
June	37·03	33·66	[illegible]
July	29·82		1·174
August	49·68		1·955
September	38·54	43·68	1·518
October	42·82		[illegible]
November	22·76		0·897
December	22·19	23·95	[illegible]
1899. January	26·90		1·059
Mean	34·3 0		1·350

Extreme range for the year: 772·14 − 711·74 = 60·40 mm.
30·400 − 28·022 = 2·378 inches.

TABLE VII.—DIFFERENCES OF MONTHLY MEANS OF PRESSURE FROM THE MEAN OF THE YEAR.

(The + sign indicates pressure greater than the mean, the − sign pressure less than the mean.)

	mm.	Inches.	
1899. February	−8·2	−0·323	
1898. March	−3·3	−0·130	minimum.
April	−9·1	−0·358	
May	+1·6	+0·063	
June	+4·8	+0·189	maximum.
July	+3·1	+0·122	
August	+2·5	+0·098	
September...	+0·8	+0·031	2nd minimum.
October	0·0	0·000	
November	+1·3	+0·051	
December	+3·5	+0·138	2nd maximum.
1899. January	+2·6	+0·102	

TABLE VIII.—TABLE OF WIND-DIRECTIONS.

The figures show the number of hours during which the wind blew from each direction.

	N.	N.N.E.	N.E.	E.N.E.	E.	E.S.E.	S.E.	S.S.E.	S.	S.S.W.	S.W.	W.S.W.	W.	W.N.W.	N.W.	N.N.W.
1898.																
March	14	26	38	60	68	50	34	30	82	22	64	56	78	22	22	10
April	30	22	13	27	84	64	76	59	32	21	25	20	51	49	50	31
May	100	121	72	8	17	33	4	7	9	1	2	17	65	75	61	83
June	14	22	26	33	34	25	28	9	24	8	76	38	191	87	37	16
July	22	10	1	—	24	72	31	70	54	28	48	38	81	48	25	4
August	32	14	38	29	26	9	34	5	19	10	47	56	141	76	104	38
Sept.	51	24	74	44	46	22	28	14	49	16	47	21	59	45	24	17
Oct.	47	31	46	8	45	11	7	18	41	24	69	74	91	42	83	32
Nov.	34	35	69	98	79	32	21	14	21	31	37	28	38	28	18	21
Dec.	3	12	53	92	67	107	55	16	21	24	63	58	44	5	11	7
1899.																
Jan	8	16	124	156	104	84	52	72	20	12	28	16	8	—	—	—
Feb.	32	42	70	49	111	99	72	37	22	10	18	23	35	13	17	6
	387	375	624	599	705	608	442	351	394	207	519	445	882	490	452	265

TABLE IX.

Column 1 shows number of days of continuous fog or overcast sky.
Column 2 shows number of days with sky partially clear for several hours in succession (cloud amount 30 per cent. or more).
Column 3 shows number of days on which fog was observed.

	1	2	3
March	6	15	14
April	10	14	26
May	15	8	27
June	5	16	28
July	7	22	17
August	9	15	25
September	9	14	14
October	16	12	23
November	13	10	18
December	9	13	13
January	17	6	17
February	21	1	23

TABLE X.

Column 1 shows the number of days on which snow was recorded.
Column 2 shows the number of days on which rain was recorded.

	1	2
March	13	—
April	22	—
May	30	4
June	24	—
July	14	—
August	26	1
September	19	—
October	25	2
November	25	—
December	18	—
January	19	4
February	22	3
Year	257	14

TABLE XI.

Column 1 shows the number of days of calm, or of wind not exceeding force 1.
Column 2 shows the number of days of wind-force less than 4.

	1	2
March	0	11
April	2	5
May	3	13
June	3	11
July	15	25
August	3	15
September	7	20
October	4	11
November	8	21
December	4	21
January	5	24
February	1	12

WAS AUSTRALIA DISCOVERED IN THE SIXTEENTH CENTURY?

By EDWARD HEAWOOD, M.A.

Few questions have exercised the minds of historical geographers more than that of the discovery of Australia. Whereas the first voyage to that country of which we have any authentic record took place in 1606, it has long been imagined, from indications on maps of much earlier date, that voyages—of which all record is now lost—were made considerably over half a century earlier, while if such were proved to have been the case, the honour of the discovery would be transferred from the Dutch, by whom the voyage of 1606 was carried out, to some other European nation, whose navigators had appeared earlier in that quarter of the globe. As is well known, the late Mr. R. H. Major, in the collection of documents edited by him for the Hakluyt Society in 1859, did more than any one to give currency to the idea of a discovery early in the sixteenth century; but his views have since met with wide acceptance, and the great probability of such a discovery has been generally allowed by subsequent writers, none of whom, however, appears to have yet undertaken a searching investigation into the grounds on which such opinion is based.

Without claiming any such character of completeness for the present contribution to the subject, it may still be not amiss to look briefly at the question as it now stands, and to point out certain lines of inquiry, which, if followed up by competent critics, might possibly lead to a further elucidation of its difficulties. The facts on which the idea above alluded to is based are briefly as follows. On a series of manuscript maps of the middle of the sixteenth century,* the region to the south and south-east of Java is occupied by a land of continental proportions, bearing round its coasts a fairly detailed nomenclature, apparently the outcome of some definite voyage of discovery. This land is separated from Java only by a narrow strait, and is actually joined in the north to Sumbawa. Although differing in minor points, all these maps present such a striking general resemblance as to leave little room for doubt that all were based on a single prototype. All are the work of a French school of cartographers, and the nomenclature is French with a certain admixture of Portuguese forms. From the fact that the map supposed to be the earliest in date (1530–36) contains the most marked signs of Portuguese influence, it has been supposed that the prototype was a Portuguese map, and that the discoveries intended to be pourtrayed were the work of navigators of that nation. Some, however, have held that the discoveries were more probably French. From a fancied resemblance of the coast-lines on these maps with those of Australia, but still more from the fact that Australia is the only large land in this quarter of the globe, it has been concluded that the coasts of Australia were first reached before the middle of the sixteenth century.

As regards the identification of the coasts with those of Australia, it may be pointed out that, setting aside differences of longitude as unimportant, and disregarding the evidently hypothetical southward extension of the coast-lines, the parts to which the definite nomenclature applies extend through 15° of latitude more than Australia and Tasmania combined. This would be a minor point were we dealing with the fanciful maps based largely on statements of old travellers, but in the case of charts supposed to be the result of a real survey, deserves at least to be noticed. Secondly, the fact that the northern point coincides roughly in latitude with Cape York

* Three of these maps, now in the British Museum, were last year published in facsimile by the late Mr. C. H. Coote, with explanatory letterpress.

is manifestly accidental, since that point really represents Sumbawa. The agreement is the accidental and quite irrelevant one between the latitudes of Sumbawa and Cape York. Again, the average direction of the north-east coast differs by at least 20° from that of Queensland, the portion of Australia presenting the nearest resemblance in this respect; while, taken as a whole, the outlines present a much more striking resemblance if we turn the map through 90°, making the east north! As regards the nomenclature, which has also been called in as a means of identification, the only terms found of any aid in the attempt have been those which might apply almost to any coast in the world (Coste dangereuse, Coste des Herbaiges, etc.); while, lastly, a difficulty arises from the necessity of supposing at least two separate voyages of discovery, one on each coast, though absolutely no record of any such exists. Thus, after all, the argument rests almost entirely on the fact that early in the sixteenth century a certain unknown map-maker drew a large land, with indications of definite knowledge of its coasts, in the quarter of the globe in which Australia is placed.

The difficulty, of course, has been to account for this map in any other way, and the following suggestions are merely put forward as a possible indication of the direction in which an explanation might be found. It will be useful, at the outset, to lay stress on one or two known facts.

Firstly, we must remember the great influence still exercised by the early travellers and writers, especially Marco Polo, on the cartography of the early part of the sixteenth century. This is shown, on the one hand, by the number of large islands strewn broadcast over the ocean to the south-east of Asia by such map-makers as Schöner; and on the other, by the persistent belief in a southern continent manifested even before the voyage of Magellan, which led to the representation of masses of land in a somewhat higher latitude, often designated Regio Patalis, a term used by Roger Bacon in the thirteenth century. A second point to be borne in mind is the fertile source of confusion introduced by Marco Polo's nomenclature of the Sunda Isles, his Java Minor representing Sumatra, while through his ignorance of the south coast of Java, he spoke of that island as Java Major * with a circuit of 3000 miles. A second Java, apart from Sumatra, constantly recurs in maps even of the close of the sixteenth century. Again, it is self-evident that the maps of the French school, or at least their prototype, were pieced together from independent sources. In their northern parts they show well the knowledge of the archipelago possessed at the time by the Portuguese; while even if the large land represented were really Australia, its incorrect position with respect to the rest of the map would have been due to manipulation by the cartographer.† Lastly, it will be a help to remember that, as lately shown by Dr. Tomaschek in his introduction to the German translation of the 'Mohit,' the Portuguese maps of the period were to a large extent based on native charts and sailing directions.

With these facts before us, if we find a map of the period showing a large land to the south-east of Asia bearing the title Jave la Grande, the natural conclusion is that the map-maker has intended it for the Java Major of Polo; more especially

* It has been suggested that the names came to be so applied because Java was the original seat of the Javanese empire, which extended its influence also over the south part of Sumatra.

† Mr. Collingridge, who, though his conclusions may not be accepted, has brought together a useful body of facts in his 'Discovery of Australia,' suggests a political reason for the northward extension of Australia. But it may be observed that, on the supposition of fraudulent alteration of maps, it would have been as easy for the Portuguese to invent a new land as to distort a known one.

if, as is the case with the French maps, we find a lesser Java closely adjoining. On other maps of the period the name Java Major is constantly applied in accordance with Polo's narrative. Therefore, apart from other considerations, the Jave la Grande of the French maps should represent Java. Now, the cartographer—starting from the idea, natural when Sumatra became well known under its true name, that the modern Java with its comparatively small area was the Java Minor of the old traveller—would naturally place his Java Major in the unoccupied region to the south. If he sought for details as to its contour in the representations of Java Major on the maps of the period, he would merely obtain a repetition of his own Java Minor, of which, therefore, we should find a reduplication on his map. Now, it is certainly remarkable that on the earliest known Portuguese map of the islands, we do find an instance of such reduplication, though arising from another cause. The map attributed to Pero Reinel applies the name Java to the southern end of Sumatra, which is shown as separated from the rest of the island, while the true Java, greatly exaggerated in width, appears to the south-east as Sumbawa, though that island appears also in its true place. The parallel between this known case and the one we are supposing is certainly very close.* Now, if we take the so-called "Harleian" map, probably the earliest of its type, and delete those parts which are evidently hypothetical (those about which no information is given), we do obtain a striking general resemblance to Java as known at the time, with the exception only that it slopes to the south-east at an angle of about 18° with the true direction. This is at least not a greater divergence than, as we have remarked, would be found if Australia were intended; and, more than this, we have a plausible means of explaining the deviation in the case of Java, in the native charts lately reconstructed by Dr. Tomaschek, which show the whole line of the Sunda islands as running in a south-east direction.

To account for such a use of his material by the cartographer, we should suppose the original map of Java to be a rough chart intended for the use of sailors, or resulting from a voyage of discovery along the coast; either with no scale or with one unintelligible to the copyist,† who would therefore fit it into his map in accordance with his preconceived ideas. That such charts were in existence at the time is shown by Dr. Tomaschek's work, as well as by a letter of Albuquerque, to which we shall recur presently.

The only European navigators whose ships are known to have visited Java before 1530 were the Portuguese, and it is to their maps that we must look for contemporary representations of its coasts. A good idea of the state of their knowledge about this time is supplied by Dr. Hamy's paper entitled "L'Œuvre Géographique des Reinel et la découverte des Moluques," which contains some interesting facts bearing upon the present question. The writer discusses the first voyage to the Spice islands—that of Dabreu in 1511—as described by Galvano in his history of the 'Discoveries of the World.' The expedition sailed down the eastern coast of Sumatra and along the north of Java, passing between the main island and Madura, and then proceeding eastwards past the chain of smaller islands in that direction. The supposed map of Reinel already alluded to shows the main results of the voyage, but more details are given in the charts of the Pilot Rodriguez, reproduced by Santarem in his well-known Atlas. Dr. Hamy quotes from

* A curious instance of the accidental shifting of the position of an island occurs on this same map. The island of Gunong Api (Ilha de Fugo) is shown in exactly the same relation to the false Sumbawa (Java) which it really bears to the true Sumbawa.

† It has been suggested that Ptolemy's great exaggeration of the size of Ceylon was due to his mistaking the intervals between the lines drawn across native charts for spaces of a degree.

a letter of Albuquerque a statement which seems to show that Rodriguez, whose delineation of the islands is superior in many ways to that of his contemporaries, had to some extent drawn from native sources, especially from a large map by a Javanese pilot, which unfortunately was afterwards destroyed. Rodriguez's charts were on a large scale, so that we find already in existence—quite early in the sixteenth century—material such as could have been drawn upon by the French cartographer; while Parmentier's voyage of 1529 supplies the means by which such material could reach France. Dr. Hamy gives a map on which he shows in red the extent of coast-line known to the Portuguese in about 1519, and it is a striking fact that his red line, so far as Java is concerned, is absolutely identical in extent with the coasts shown on the French map on the supposition that Jave la Grande does represent Java.

As regards the contour of Jave la Grande, it is to be observed that, owing to the piecing together of the data by the cartographer, a certain amount of alteration must necessarily have been made in order to effect the junction with Sumbawa. The extreme northern portion must therefore be left out of consideration in comparing the form with that of Java. The most striking resemblance is to be seen in the south-west corner, where the bays and small islands are in close agreement with those on the coast of Java. The distance of Madura from the coast—if that island is supposed to be represented by the Isles de Mayna of the French map—is the most serious discrepancy, but this is small compared with the known shifting of positions on contemporary maps.* It is singular also that, with the other two groups further north, we have just the three islands or groups of islands, marked in red on Hamy's map as known to the Portuguese.

Coming next to the nomenclature of the French maps, we face peculiar difficulties, as the readings in many cases are evidently corrupt, and discrepancies exist between the different copies extant. This is not surprising when we think of the corruptions of names occurring in well-authenticated maps,† and that the maps we are now dealing with are possibly copies from a French prototype, itself based on Portuguese documents, which in their turn may have owed something to Arabic originals. Another difficulty arises from the paucity of names possessing any determinative value. A few points of interest however occur. One of the few legends appearing to record an actual place-name occurs near the great bay on the north-east coast, where we find the words Coste de Gracal. This exactly occupies the position of Gressie or Gressik (Agaçim of De Barros, Grece of many Portuguese and Dutch maps, Agracam of Mercator), which strangely enough was the first place on Java at which the Portuguese are known to have landed. The name was referred by Major (*Archæologia*, vol. xliv. p. 240) to a Provençal word meaning "bowl," but on the supposition that the original map-maker was a native of Provence, the case might merely be one of the substitution of a familiar for an

* See note on p. 423. Another instance might be given in the transference of two Javanese names—Tuban and Agaçim—to Celebes, on various maps of a somewhat later date.

† Perhaps the most singular corruptions are those concerned with the nomenclature of Bali and Lombok on maps of the period. In Galvano's account, Lombok is named Anjano (Aujane of Hakluyt), apparently from the great volcano Renjane, its most conspicuous feature. On certain maps this appears as Ancane, while in others again this is cut in two and applied to two islands, both names beginning with a capital ("Anc," "Ane"). In the Harleian chart it appears in conjunction with a corruption of the name of Bali, and the whole is read by Mr. Collingridge as "Anda ne barche" ("No boats go here"). The alteration in some maps of "Fin de iaoa" into "Fideida" is another striking instance of corruption.

unfamiliar word. Again, on the west coast, we find on the French maps the Baie Bresill, and, though the frequent use of this word in the geographical nomenclature of the period makes us hesitate to found any argument thereon,* it is interesting to find, from the letter of Albuquerque above alluded to, that the Javanese map seen by Rodriguez, or at least the draught of it made by him, included the "Terra de Brasyll." It is possible that this really refers to the modern Brazil, but at this early date (1512) the name had certainly not come into general use as an appellation for that country, which was still known as "Terra Sancte Crucis." Traces at least of a dual use of the term about this time occur elsewhere, especially in the confusion shown by the author of the 'Copia der newen Zeitung,' who speaks of the land of Presill as situated near a strait (? the strait of Sunda), and as extending to Malacca. Mr. Collingridge, who quotes Andrea Corsali as mentioning a land of Brazil near the Malay archipelago, imagines that these indications refer to Australia; but from the fact that Brazil wood is a well-known product of the archipelago, any eastern land of Brazil would much more probably lie within that region. Again, the large island off the coast bears the name Lama, or Lame, on the French maps, and it is conceivable that this might represent the termination of Sumatra (Camatra),† which name frequently occurs with a break in the middle on maps of the period.

It is to be regretted that the early Portuguese and Dutch maps give very scanty details respecting the western end of Java, for as the nomenclature is particularly full on the corresponding coast of Jave la Grande, a comparison would be likely to prove interesting. The occurrence of Cap de Grace on this coast has led to the suggestion of a discovery by Provençal navigators, more especially as one copy of the map appears in the atlas of the Provençal pilot Guillaume le Testu. The French ship said to have reached the legendary "Island of Gold" soon after 1527 (*Journal*, vol. xi. p. 82) is at least as likely to have reached a point on the south-west coast of Java as to have discovered Australia. In this case we should suppose that French names had been added to a Portuguese chart by the French pilot.

On the supposition of a reduplication of Java, such as we have hinted at, we might expect to find a repetition of names on the west coast of Java itself, and on that of Jave la Grande, but here again the paucity of names on the former removes the opportunity for effective comparison. Still, it is remarkable that the only two names occurring in Western Java, the R. de St. P° (Pedro?) or Pierre, and Coste P°uro, should have their counterparts in Jave la Grande in the form of C. de St. Drao (or A° ‡) and Coste Blanche. It is possible that some clue might be obtained by an examination of the early Portuguese voyages, with a view to explaining the use of the appellative San Pedro, though it is possible that the legend is a corruption of the word "padrao" (pillar), for we are told in Albuquerque's commentaries that the pilot Rodriguez so often alluded to was a man who "knew very well how to set up a memorial monument if it were required" (Hakluyt Soc. Ed., vol. iii. p. 162).

A word or two may be devoted to the islands shown on the French maps in the sea to the north-east of Jave la Grande, which seem to present examples of undoubted Portuguese words. The Yles de Aliofer are evidently named from the word Alojfar (Arabic taken over into Portuguese), "seed-pearl." The next group is named Y^{e} de Tubaros—Isle of Sharks—in the Harleian map, and this is interesting in view of the comparatively early date of this particular map, for in another of the series

* It has been suggested that the "Baie Bresill" has been derived from the "Brasilie" applied to the supposed southern continent by Orontius Finaeus (1531).

† C on some old maps being hardly distinguishable from L.

‡ The variation in different French maps shows that there is some corruption here.

(the so-called Henri II. map) the name has been translated Y^e de Marsouyns (Isle of Porpoises). It is impossible to decide in what relation these islands stand to the other parts of the map. It may be intended either to show their supposed position with respect to Jave la Grande on the one hand, or the archipelago and Pacific ocean * on the other, or merely to indicate that islands whence certain commodities were obtained lay in the seas to the east. It is difficult to find any evidence respecting the application of such names by the Portuguese, and as both seed-pearls and shark's fins are well-known products of the archipelago, the names would apply equally to many islands. An island of Turtles figures in the narratives of the Portuguese historians, and in some modern maps a Turtle island is placed close to Bawean ("Isle of Swine" in Javanese), which would, on one supposition, correspond in position with the Y^e de Tubaros. It does not seem impossible that the Portuguese may have mistranslated a native name in this case. A possible explanation of one of the names applied to the third group (Isles de Mayna, or Magaa) is that it is a corruption of the Ilhas das Maçans (Mace islands), by which name Banda was often known. In this case the name Saill applied to the smaller island near it might stand for Ceram, named Seillan in its proper place on the Harleian chart.

In conclusion, it may be observed that, though the divergence in size appears much more serious in the comparison of Jave la Grande with Java than with Australia, the lesser divergence in the latter case is really the more important, as in this the whole argument is based almost solely on considerations of size. In favour of the identification with Java is the fact that this puts no strained construction on the data, but supposes Jave la Grande simply to represent the island so named at the time. In any case, the slight reliance to be placed on the French maps with respect to outlying parts of the world, and the influence still exercised by the old writers, is shown by their delineation of Japan, the insertion of an Isle des Géants in the Southern Indian ocean, and of Catigara on the west coast of South America, as also by the fictitious coast-line of a southern continent with numerous bays and rivers, shown in the later versions. This should surely make us hesitate to base so important assumption as that of a discovery of Australia in the sixteenth century on their unsupported testimony.

OCEANOGRAPHY.†

By Sir JOHN MURRAY, K.C.B., F.R.S., D.SC., LL.D.

In his opening Address to the members of the British Association at the Ipswich meeting, the President cast a retrospective glance at the progress that had taken place in the several branches of scientific inquiry from the time of the formation of the Association in 1831 down to 1895, the year in which were published the last two of the fifty volumes of Reports containing the scientific results of the voyage of H.M.S. *Challenger*. In that very able and detailed review there is no reference whatever to the work of the numerous expeditions which had been fitted out by

* In this case, the Isle of Sharks would, of course, represent the island of that name touched at by Magellan, and a comparison with other maps on which this is shown would seem to favour this view. The identification of the other groups would, however, be a difficulty.

† Presidential address to the geographical section of the British Association, Dover, September 14, 1899. Map, p. 472.

this and other countries for the exploration of the depths of the sea, nor is there any mention of the great advance in our knowledge of the ocean during the period of sixty-five years then under consideration. This omission may be accounted for by the fact that, at the time of the formation of the British Association, knowledge concerning the ocean was, literally speaking, superficial. The study of marine phenomena had hitherto been almost entirely limited to the surface and shallow waters of the ocean, to the survey of coasts and of oceanic routes directly useful for commercial purposes. Down to that time there had been no systematic attempts to ascertain the physical and biological conditions of those regions of the Earth's surface covered by the deeper waters of the ocean; indeed, most of the apparatus necessary for such investigations had not yet been invented.

The difficulties connected with the exploration of the greater depths of the sea arise principally from the fact that, in the majority of cases, the observations are necessarily indirect. At the surface of the ocean direct observation is possible, but our knowledge of the conditions prevailing in deep water, and of all that is there taking place, is almost wholly dependent on the correct working of instruments, the action of which at the critical moment is hidden from sight.

It was the desire to establish telegraphic communication between Europe and America that gave the first direct impulse to the scientific exploration of the great ocean-basins, and at the present day the survey of new cable routes still yields each year a large amount of accurate knowledge regarding the floor of the ocean. Immediately before the *Challenger* expedition there was a marked improvement in all the apparatus used in marine investigations, and thus during the *Challenger* expedition the great ocean-basins were for the first time systematically and successfully explored. This expedition, which lasted for nearly four years, was successful beyond the expectations of its promoters, and opened out a new era in the study of oceanography. A great many sciences were enriched by a grand accumulation of new facts. Large collections were sent and brought home, and were subsequently described by specialists belonging to almost every civilized nation. Since the *Challenger* expedition there has been almost a revolution in the methods employed in deep-sea observations. The most profound abysses of the ocean are now being everywhere examined by sailors and scientific men with increasing precision, rapidity, and success.

The recognition of oceanography as a distinct branch of science may be said to date from the commencement of the *Challenger* investigations. The fuller knowledge we now possess about all oceanic phenomena has had a great modifying influence on many general conceptions as to the nature and extent of those changes which the crust of the earth is now undergoing and has undergone in past geological times. Our knowledge of the ocean is still very incomplete. So much has, however, already been acquired that the historian will, in all probability, point to the oceanographical discoveries during the past forty years as the most important addition to the natural knowledge of our planet since the great geographical voyages associated with the names of Columbus, Da Gama, and Magellan, at the end of the fifteenth and the beginning of the sixteenth centuries.

It is not my intention on this occasion to attempt anything like a general review of the present state of oceanographic science. But, as nearly all the samples of marine deposits collected during the past thirty years have passed through my hands, I shall endeavour briefly to point out what, in general, their detailed examination teaches with respect to the present condition of the floor of the ocean, and I will thereafter indicate what appears to me to be the bearing of some of these results on speculations as to the evolution of the existing surface features of our planet.

Depth of the Ocean.

All measurements of depth, by which we ascertain the relief of that part of the earth's crust covered by water, are referred to the sea-surface; the measurements of height on the land are likewise referred to sea-level. It is admitted that the ocean has a very complicated undulating surface, in consequence of the attraction which the heterogeneous and elevated portions of the lithosphere exercise on the liquid hydrosphere. In the opinion of geodesists the geoid may in some places depart from the figure of the spheroid by 1000 feet. Still it is not likely that this surface of the geoid departs so widely from the mean ellipsoidal form as to introduce a great error into our estimates of the elevations and depressions on the surface of the lithosphere.

The soundings over the water-surface of the globe have accumulated at a rapid rate during the past fifty years. In the shallow water, where it is necessary to know the depth for purposes of navigation, the soundings may now be spoken of as innumerable; the 100-fathom line surrounding the land can therefore often be drawn in with much exactness. Compared with this shallow-water region, the soundings in deep water beyond the 100-fathom line are much less numerous; each year, however, there are large additions to our knowledge. Within the last decade over ten thousand deep soundings have been taken by British ships alone. The deep soundings are scattered over the different ocean-basins in varying proportions, being now most numerous in the North Atlantic and South-west Pacific, and in these two regions the contour-lines of depth may be drawn in with greater confidence than in the other divisions of the great ocean-basins. It may be pointed out that 659 soundings taken quite recently during cable surveys in the North Atlantic, although much closer together than is usually the case, and yielding much detailed information to cable engineers, have, from a general point of view, necessitated but little alteration in the contour-lines drawn on the *Challenger* bathymetrical maps published in 1895. Again, the recent soundings of the German s.s. *Valdivia* in the Atlantic, Indian, and Southern oceans have not caused very great alteration in the positions of the contour-lines on the *Challenger* maps, if we except one occasion in the South Atlantic when a depth of 2000 fathoms was expected and the sounding machine recorded a depth of only 536 fathoms, and again in the great Southern ocean when depths exceeding 3000 fathoms were obtained in a region where the contour-lines indicated between 1000 and 2000 fathoms. This latter discovery suggests that the great depth recorded by Ross to the south-east of South Georgia may not be very far from the truth.

I have redrawn the several contour-lines of depth in the great ocean-basins, after careful consideration of the most recent data, and these may now be regarded as a somewhat close approximation to the actual state of matters, with the possible exception of the great Southern and Antarctic oceans, where there are relatively few soundings, but where the projected antarctic expeditions should soon be at work. On the whole, it may be said that the general tendency of recent soundings is to extend the area with depths greater than 1000 fathoms, and to show that numerous volcanic cones rise from the general level of the floor of the ocean-basins up to various levels beneath the sea-surface.

The areas marked out by the contour-lines of depth are now estimated as follows:—

Between the shore and 100 fms.,	7,000,000 sq. geo. m.	(or 7 per cent. of the sea-bed)
" 100 " 1000 "	10,000,000 " "	(or 10 " " ")
" 1000 " 2000 "	22,000,000 " "	(or 21 " " ")
" 2000 " 3000 "	57,000,000 " "	(or 55 " " ")
Over 3000 fathoms,	7,000,000 " "	(or 7 " " ")
	103,000,000 sq. geo. m.	100 per cent.

From these results it appears that considerably more than half of the sea-floor lies at a depth exceeding 2000 fathoms, or over two geographical miles. It is interesting to note that the area within the 100-fathom line occupies 7,000,000 square geographical miles, whereas the area occupied by the next succeeding 900 fathoms (viz. between 100 and 1000 fathoms) occupies only 10,000,000 square geographical miles. This points to a relatively rapid descent of the sea-floor along the continental slopes between 100 and 1000 fathoms, and therefore confirms the results gained by actual soundings in this region, many of which indicate steep inclines or even perpendicular cliffs. Not only are the continental slopes the seat of many deposit-slips and seismic disturbances, but Mr. Benest has given good reasons for believing that underground rivers sometimes enter the sea at depths beyond 100 fathoms, and there bring about sudden changes in deep water. Again, the relatively large area covered by the continental shelf between the shore-line and 100 fathoms points to the wearing away of the land by current and wave action.

On the *Challenger* charts all areas where the depth exceeds 3000 fathoms have been called "deeps," and distinctive names have been conferred upon them. Forty-three such depressions are now known, and the positions of these are shown on the map here exhibited; twenty-four are situated in the Pacific ocean, three in the Indian ocean, fifteen in the Atlantic ocean, and one in the Southern and Antarctic oceans. The area occupied by these thirty-nine deeps is estimated at 7,152,000 square geographical miles, or about 7 per cent. of the total water-surface of the globe. Within these deeps over 250 soundings have been recorded, of which twenty-four exceed 4000 fathoms, including three exceeding 5000 fathoms.

Depths exceeding 4000 fathoms (or 4 geographical miles) have been recorded within eight of the deeps, viz. in the North Atlantic within the Nares deep; in the Antarctic within the Ross deep; in the Banda sea within the Weber deep; in the North Pacific with the Challenger, Tuscarora, and Sapau deeps; and in the South Pacific within the Aldrich and Richards deeps. Depths exceeding 5000 fathoms have been hitherto recorded only within the Aldrich deep of the South Pacific, to the east of the Kermadecs and Friendly islands, where the greatest depth is 5155 fathoms, or 530 feet more than 5 geographical miles, being about 2000 feet more below the level of the sea than the summit of Mount Everest in the Himalayas is above it. The levels on the surface of the lithosphere thus oscillate between the limits of about 10 geographical miles (more than 18 kilometers).

Temperature of the Ocean-floor.

Our knowledge of the temperature on the floor of the ocean is derived from observations in the layers of water immediately above the bottom by means of deep-sea thermometers, from the electric resistance of telegraph cables resting on the bed of the great ocean-basins, and from the temperature of large masses of mud and ooze brought up by the dredge from great depths. These observations are now sufficiently numerous to permit of some general statements as to the distribution of temperature over the bottom of the great oceans.

All the temperatures recorded up to the present time in the sub-surface waters of the open ocean indicate that at a depth of about 100 fathoms seasonal variation of temperature disappears. Beyond that depth there is a constant, or nearly constant, temperature at any one place throughout the year. In some special positions, and under some peculiar conditions, a lateral shifting of large bodies of water takes place on the floor of the ocean at depths greater than 100 fathoms. This phenomenon has been well illustrated by Prof. Libbey off the east coast of North America, where the Gulf stream and Labrador current run side by side in

opposite directions. This lateral shifting cannot, however, be called seasonal, for it appears to be effected by violent storms, or strong off-shore winds bringing up colder water from considerable depths to supply the place of the surface drift, so that the colder water covers stretches of the ocean's bed which under normal conditions are overlaid by warmer strata of water. Sudden changes of temperature like these cause the destruction of innumerable marine animals, and produce very marked peculiarities in the deposits over the areas thus affected.

It is estimated that 92 per cent. of the entire sea-floor has a temperature lower than 40° Fahr. This is in striking contrast to the temperature prevailing at the surface of the ocean, only 16 per cent. of which has a mean temperature under 40° Fahr. The temperature over nearly the whole of the floor of the Indian ocean in deep water is under 35° Fahr. A similar temperature occurs over a large part of the South Atlantic and certain parts of the Pacific, but at the bottom of the North Atlantic basin and over a very large portion of the Pacific the temperature is higher than 35° Fahr. In depths beyond 2000 fathoms, the average temperature over the floor of the North Atlantic is about 2° Fahr., above the average temperature at the bottom of the Indian ocean and South Atlantic, while the average temperature of the bed of the Pacific is intermediate between these.

It is admitted that the low temperature of the deep sea has been acquired at the surface in polar and sub-polar regions, chiefly within the higher latitudes of the southern hemisphere, where the cooled surface water sinks to the bottom and spreads slowly over the floor of the ocean into equatorial regions. These cold waters carry with them into the deep sea the gases of the atmosphere, which are everywhere taken up at the surface according to the known laws of gas absorption. In this way myriads of living animals are enabled to carry on their existence at all depths in the open ocean. The nitrogen remains more or less constant at all times and places, but the proportion of oxygen is frequently much reduced in deep water, owing to the processes of oxidation and respiration which are there going on.

The deep sea is a region of darkness as well as of low temperature, for the direct rays of the sun are wholly absorbed in passing through the superficial layers of water. Plant-life is in consequence quite absent over 93 per cent. of the bottom of the ocean, or 66 per cent. of the whole surface of the lithosphere. The abundant deep-sea fauna, which covers the floor of the ocean, is therefore ultimately dependent for food upon organic matter assimilated by plants near its surface, in the shallower waters near the coast-lines, and on the surface of the dry land itself.

As has been already stated, about 7,000,000 square geographical miles of the sea-floor lies within the 100-fathom line, and this area is in consequence subject to seasonal variations of temperature, to strong currents, to the effects of sunlight, and presents a great variety of physical conditions. The planktonic plant-life is here reinforced by the littoral seaweeds, and animal life is very abundant. About 40 per cent. of the water over the bottom of this shallow-water area has a mean temperature under 40° Fahr., while 20 per cent. has a mean temperature between 40° and 60° Fahr., and 40 per cent. a temperature of over 60° Fahr.

It follows from this that only 3 per cent. of the floor of the ocean presents conditions of temperature favourable for the vigorous growth of corals and those other benthonic organisms which make up coral reefs and require a temperature of over 60° Fahr. all the year round. On the other hand, more than half of the surface of the ocean has a temperature which never falls below 60° Fahr. at any time of the year. In these surface-waters with a high temperature the shells of pelagic molluscs, foraminifera, algæ, and other planktonic organisms, are secreted in great abundance, and fall to the bottom after death.

It thus happens that, at the present time, over nearly the whole floor of the ocean we have mingled in the deposits the remains of organisms which had lived under widely different physical conditions, since the remains of organisms which lived in tropical sunlight, and in water at a temperature above 80° Fahr., all their lives, now lie buried in the same deposit on the sea-floor together with the remains of other organisms which lived all their lives in darkness and at a temperature near to the freezing-point of fresh water.

Marine Deposits on the Ocean-floor.

The marine deposits now forming over the floor of the ocean present many interesting peculiarities according to their geographical and bathymetrical position. On the continental shelf, within the 100-fathom line, sands and gravels predominate, while on the continental slopes beyond the 100-fathom line, blue muds, green muds, and red muds, together with volcanic muds and coral muds, prevail, the two latter kinds of deposits being, however, more characteristic of the shallow water around oceanic islands. The composition of all these terrigenous deposits depends on the structure of the adjoining land. Around continental shores, except where coral reefs, limestones, and volcanic rocks are present, the materials consist principally of fragments and minerals derived from the disintegration of the ancient rocks of the continents, the most characteristic and abundant mineral species being quartz. River detritus extends in many instances far from the land, while off high and bold coasts, where no large rivers enter the sea, pelagic conditions may be found in somewhat close proximity to the shore-line. It is in these latter positions that green muds containing much glauconite, and other deposits containing many phosphatic nodules, have for the most part been found; as, for instance, off the eastern coast of the United States, off the Cape of Good Hope, and off the eastern coasts of Australia and Japan. The presence of glauconitic grains and phosphatic nodules in the deposit at these places appears to be very intimately associated with a great annual range of temperature in the surface and shallow waters, and the consequent destruction of myriads of marine animals. As an example of this phenomenon may be mentioned the destruction of the tile-fish in the spring of 1882 off the eastern coast of North America, when a layer, 6 feet in thickness, of dead fish and other marine animals, was believed to cover the ocean-floor for many square miles.

In all the terrigenous deposits the evidences of the mechanical action of tides, of currents, and of a great variety of physical conditions, may almost everywhere be detected, and it is possible to recognize in these deposits an accumulation of materials analogous to many of the marine stratified rocks of the continents, such as sandstones, quartzites, shales, marls, greensands, chalks, limestones, conglomerates, and volcanic grits.

With increasing depth and distance from the continents the deposits gradually lose their terrigenous character, the particles derived directly from the emerged land decrease in size and in number, the evidences of mechanical action disappear, and the deposits pass slowly into what have been called pelagic deposits at an average distance of about 200 miles from continental coast-lines. The materials composing pelagic deposits are not directly derived from the disintegration of the continents and other land-surfaces. They are largely made up of the shells and skeletons of marine organisms secreted in the surface waters of the ocean, consisting either of carbonate of lime, such as pelagic molluscs, pelagic foraminifera, and pelagic algæ, or of silica, such as diatoms and radiolarians. The inorganic constituents of the pelagic deposits are for the most part derived from the attrition of floating pumice, from the disintegration of water-logged pumice, from showers of

volcanic ashes, and from the *débris* ejected from submarine volcanoes, together with the products of their decomposition. Quartz particles, which play so important a *rôle* in the terrigenous deposits, are almost wholly absent, except where the surface waters of the ocean are affected by floating ice, or where the prevailing winds have driven the desert sands far into the oceanic areas. Glauconite is likewise absent from these abysmal regions. The various kinds of pelagic deposits are named according to their characteristic constituents, pteropod oozes, globigerina oozes, diatom oozes, radiolarian oozes, and red clay.

The distribution of the deep-sea deposits over the floor of the ocean is shown on the map here exhibited, but it must be remembered that there is no sharp line of demarcation between them; the terrigenous pass gradually into the pelagic deposits, and the varieties of each of these great divisions also pass insensibly the one into the other, so that it is often difficult to fix the name of a given sample.

On another map here exhibited the percentage distribution of carbonate of lime in the deposits over the floor of the ocean has been represented, the results being founded on an extremely large number of analyses. The results are also shown in the following table:—

	Sq. geo. miles.	Percentage.
Over 75 per cent. $CaCO_3$	6,000,000	5·8
50 to 75 " "	24,000,000	23·2
25 to 50 " "	14,000,000	13·5
Under 25 " "	59,000,000	57·5
	103,000,000	100

The carbonate of lime shells derived from the surface play a great and puzzling *rôle* in all deep-sea deposits, varying in abundance according to the depth of the ocean and the temperature of the surface waters. In tropical regions removed from land, where the depths are less than 600 fathoms, the carbonate of lime due to the remains of these organisms from the surface may rise to 80 or 90 per cent.; with increase of depth, and under the same surface conditions, the percentage of carbonate of lime slowly diminishes, till, at depths of about 2000 fathoms, the average percentage falls to about 60, at 2400 fathoms to about 30, and at about 2600 fathoms to about 10, beyond which depth there may be only traces of carbonate of lime due to the presence of surface shells. The thin and more delicate surface shells first disappear from the deposits, the thicker and denser ones alone persist to greater depths. A careful examination of a large number of observations shows that the percentage of carbonate of lime in the deposits falls off much more rapidly at depths between 2200 and 2500 fathoms than at other depths.

The red clay, which occurs in all the deeper stretches of the ocean far from land, and covers nearly half of the whole sea-floor, contains—in addition to volcanic *débris*, clayey matter, the oxides of iron and manganese—numerous remains of whales, sharks, and other fishes, together with zeolitic crystals, manganese nodules, and minute magnetic spherules, which are believed to have a cosmic origin. One haul of a small trawl in the Central Pacific brought to the surface on one occasion, from a depth of about 2½ miles, many bushels of manganese nodules, along with fifteen hundred sharks' teeth, over fifty fragments of earbones and other bones of whales. Some of these organic remains, such as the *Carcharodon* and *Lamna* teeth and the bones of the ziphioid whales, belong apparently to extinct species. One or two of these sharks' teeth, earbones, or cosmic spherules, may be occasionally found in a globigerina ooze, but their occurrence in this or any deposits other than red clay is extremely rare.

Our knowledge of the marine deposits is limited to the superficial layers; as a rule the sounding-tube does not penetrate more than 6 or 8 inches, but in some positions the sounding-tube and dredge have been known to sink fully 2 feet into the deposit. Sometimes a red clay is overlaid by a globigerina ooze, more frequently a red clay overlies a globigerina ooze, the transition between the two layers being either abrupt or gradual. In some positions it is possible to account for these layers by referring them to changes in the condition of the surface waters, but in other situations it seems necessary to call in elevations and subsidences of the sea-floor.

If the whole of the carbonate of lime shells be removed by dilute acid from a typical sample of globigerina ooze, the inorganic residue left behind is quite similar in composition to a typical red clay. This suggests that possibly, owing to some hypogene action, such as the escape of carbonic acid through the sea-floor, a deposit that once was a globigerina ooze might be slowly converted into a red clay. However, this is not the interpretation which commends itself after an examination of all the data at present available; a consideration of the rate of accumulation probably affords a more correct interpretation. It appears certain that the terrigenous deposits accumulate much more rapidly than the pelagic deposits. Among the pelagic deposits the pteropod and globigerina oozes of the tropical regions, being made up of the calcareous shells of a much larger number of tropical species, apparently accumulate at a greater rate than the globigerina oozes in extra-tropical areas. Diatom ooze being composed of both calcareous and siliceous organisms has again a more rapid rate of deposition than radiolarian ooze. In red clay the minimum rate of accumulation takes place. The number of sharks' teeth, of ear-bones and other bones of cetaceans, and of cosmic spherules, in a deposit may indeed be taken as a measure of the rate of deposition. These spherules, teeth, and bones are probably more abundant in the red clays, because few other substances there fall to the bottom to cover them up, and they thus form an appreciable part of the whole deposit. The volcanic materials in a red clay having, because of the slow accumulation, been for a long time exposed to the action of sea-water, have been profoundly altered. The massive manganese-iron nodules and zeolitic crystals present in the deposit are secondary products arising from the decomposition of these volcanic materials, just as the formation of glauconite, phosphatic, and calcareous and barytic nodules accompanies the decomposition of terrigenous rocks and minerals in deposits nearer continental shores. There is thus a striking difference between the average chemical and mineralogical composition of terrigenous and pelagic deposits.

It would be extremely interesting to have a detailed examination of one of those deep holes where a typical red clay is present, and even to bore some depth into such a deposit if possible, for in these positions it is probable that not more than a few feet of deposit have accumulated since the close of the Tertiary period. One such area lies to the south-west of Australia, and its examination might possibly form part of the programme of the approaching Antarctic explorations.

Life on the Ocean-floor.

It has already been stated that plant-life is limited to the shallow waters, but fishes and members of all the invertebrate groups are distributed over the floor of the ocean at all depths. The majority of these deep-sea animals live by eating the mud, clay, or ooze, or by catching the minute particles of organic matter which fall from the surface. It is probably not far from the truth to say that three-fourths of the deposits now covering the floor of the ocean have passed through the alimentary canals of marine animals. These mud-eating species, many

of which are of gigantic size when compared with their allies living in the shallow coastal waters, become in turn the prey of numerous rapacious animals armed with peculiar prehensible and tactile organs. Some fishes are blind, while others have very large eyes. Phosphorescent light plays a most important *rôle* in the deep sea, and is correlated with the prevailing red and brown colours of deep-sea organisms. Phosphorescent organs appear sometimes to act as a bull's-eye lantern to enable particles of food to be picked up, and at other times as a lure or a warning. All these peculiar adaptations indicate that the struggle for life may be not much less severe in the deep sea than in the shallower waters of the ocean.

Many deep-sea animals present archaic characters; still the deep sea cannot be said to contain more remnants of faunas which flourished in remote geological periods than the shallow and fresh waters of the continents. Indeed, king-crabs, lingulas, trigonias, Port Jackson sharks, *ceratodus*, *lepidosiren*, and *protopterus*, probably represent older faunas than anything to be found in the deep sea.

Sir Wyville Thomson was of opinion that, from the Silurian period to the present day, there had been as now a continuous deep ocean with a bottom temperature oscillating about the freezing-point of fresh water, and that there had always been an abyssal fauna. I incline to the view that in palæozoic times the ocean-basins were not so deep as they are now; that the ocean then had throughout a nearly uniform high temperature, and that life was either absent or represented only by bacteria and other low forms in great depths, as is now the case in the Black sea, where life is practically absent beyond 100 fathoms, and where the deeper waters are saturated with sulphuretted hydrogen. This is not, however, the place to enter on speculations concerning the origin of the deep-sea fauna, nor to dwell on what has been called "bipolarity" in the distribution of marine organisms.

Evolution of the Continental and Oceanic Areas.

I have now pointed out what appears to me to be some of the more general results arrived at in recent years regarding the present condition of the floor of the ocean. I may now be permitted to indicate the possible bearing of these results on opinions as to the origin of some fundamental geographical phenomena; for instance, on the evolution of the protruding continents and sunken ocean-basins. In dealing with such a problem much that is hypothetical must necessarily be introduced, but these speculations are based on ascertained scientific facts.

The well-known American geologist, Dutton, says: "It has been much the habit of geologists to attempt to explain the progressive elevation of plateaus and mountain platforms, and also the folding of strata, by one and the same process. I hold the two processes to be distinct, and having no necessary relation to each other. There are plicated regions which are little or not at all elevated, and there are elevated regions which are not plicated." Speaking of great regional uplifts, he says further: "What the real nature of the uplifting force may be is, to my mind, an entire mystery, but I think we may discern at least one of its attributes, and that is a gradual expansion or a diminution of density of the subterranean magmas. . . . We know of no cause which could either add to the mass or diminish the density, yet one of the two must surely have happened. . . . Hence I infer that the cause which elevates the land involves an expansion of the underlying magmas, and the cause which depresses it is a shrinkage of the magmas; the nature of the process is at present a complete mystery." I shall endeavour to show how the detailed study of marine deposits may help to solve the mystery here referred to by Dutton.

The surface of the globe has not always been as we now see it. When, in the

past, the surface had a temperature of about 400° Fahr., what is now the water of the ocean must have existed as water-vapour in the atmosphere, which would thereby—as well as because of the presence of other substances—be increased in density and volume. Life, as we know it, could not then exist. Again, science foresees a time when low temperatures, like those produced by Prof. Dewar at the Royal Institution, will prevail over the face of the earth. The hydrosphere and atmosphere will then have disappeared within the rocky crust, or the waters of the ocean will have become solid rock, and over their surface will roll an ocean of liquid air about 40 feet in depth. Life, as we know it, unless it undergoes suitable secular modifications, will be extinct. Somewhere between these two indefinite points of time in the evolution of our planet it is our privilege to live, to investigate, and to speculate concerning the antecedent and future conditions of things.

When we regard our globe with the mind's eye, it appears at the present time to be formed of concentric spheres, very like, and still very unlike, the successive coats of an onion. Within is situated the vast nucleus or *centrosphere* ; surrounding this is what may be called the *tektosphere*,* a shell of materials in a state bordering on fusion, upon which rests and creeps the *lithosphere*. Then follow *hydrosphere* and *atmosphere*, with the included *biosphere*.† To the interaction of these six geospheres, through energy derived from internal and external sources, may be referred all the existing superficial phenomena of the planet.

The vast interior of the planetary mass, although not under direct observation, is known, from the results of the astronomer and physicist, to have a mean density of 5·6, or twice that of ordinary surface rock. The substances brought within the reach of observation in veinstones, in lavas, and hypogene rocks—by the action of water as a solvent and sublimant—warrant the belief that the centrosphere is largely made up of metals and metalloids with imprisoned gases. It is admitted that the vast nucleus has a very high temperature, but so enormous is the pressure of the super-incumbent crust that the melting-point of the substances in the interior is believed to be raised to a higher value than the temperature there existing—the centrosphere in consequence remains solid, for it may be assumed that the melting-point of rock-forming materials is raised by increase of pressure. Astronomers from a study of precession and nutation have long been convinced that the centrosphere must be practically solid.

Recent seismological observations indicate the transmission of two types of waves through the earth—the condensational-rarefactional and the purely distortional—and the study of these tremors supports the view that the centrosphere is not only solid, but possesses great uniformity of structure. The seismological investigations of Profs. Milne and Knott point also to a fairly abrupt boundary or transition surface, where the solid nucleus passes into the somewhat plastic magma on which the firm upper crust rests.

In this plastic layer or shell—named the *tektosphere*—the materials are most probably in a state of unstable equilibrium and bordering on fusion. Here the loose-textured solids of the external crust are converted into the denser solids of the nucleus or into molten masses, at a critical point of temperature and pressure; deep-seated rocks may in consequence escape through fissures in the lithosphere. Within the lithosphere itself the temperature falls off so rapidly towards the surface as to be everywhere below the melting-point of any substance there under its particular pressure.

Now, as the solid centrosphere slowly contracted from loss of heat, the primitive

* τηκτός, molten. † βίος, life.

lithosphere, in accommodating itself—through changes in the tektosphere—to the shrinking nucleus, would be buckled, warped, and thrown into ridges. That these movements are still going on is shown by the fact that the lithosphere is everywhere and at all times in a slight but measurable state of pulsation. The rigidity of the primitive rocky crust would permit of considerable deformations of the kind here indicated. Indeed, the compression of mountain chains has most probably been brought about in this manner, but the same cannot be said of the elevation of plateaus, of mountain platforms, and of continents.

From many lines of investigation it is concluded, as we have seen, that the centrosphere is homogeneous in structure. Direct observation, on the other hand, shows that the lithosphere is heterogeneous in composition. How has this heterogeneity been brought about? The original crust was almost certainly composed of complex and stable silicates, all the silicon dioxide being in combination with bases. Lord Kelvin has pointed out that, when the solid crust began to form, it would rapidly cool over its whole surface; the precipitation of water would accelerate this process, and there would soon be an approximation to present conditions. As time went on the plastic or critical layer—the tektosphere—immediately beneath the crust would gradually sink deeper and deeper, while ruptures and re-adjustments would become less and less frequent than in earlier stages. With the first fall of rain the silicates of the crust would be attacked by water and carbon dioxide, which can at low temperatures displace silicon dioxide from its combinations. The silicates, in consequence, have been continuously robbed of a part, or the whole, of their bases. The silica thus set free goes ultimately to form quartz veins and quartz sand on or about the emerged land, while the bases leached out of the disintegrating rocks are carried out into the ocean and ocean-basins. A continuous disintegration and differentiation of materials of the lithosphere, accompanied by a sort of migration and selection among mineral substances, is thus always in progress. Through the agency of life, carbonate of lime accumulates in one place; through the agency of winds, quartz sand is heaped up in another; through the agency of water, beds of clay, of oxides of iron and of manganese are spread out in other directions.

The contraction of the centrosphere supplies the force which folds and crumples the lithosphere. The combined effect of hydrosphere, atmosphere, and biosphere on the lithosphere gives direction and a determinate mode of action to that force. From the earliest geological times the most resistant dust of the continents has been strewn along the marginal belt of the sea-floor skirting the land. At the present time the deposits over this area contain on the average about 70 per cent. of free and combined silica, mostly in the form of quartz sand. In the abysmal deposits far from land there is an average of only about 30 per cent. of silica, and hardly any of this in the form of quartz sand. Lime, iron, and the other bases largely predominate in these abysmal regions. The continuous loading on the margins of the emerged land by deposits tends by increased pressure to keep the materials of the tektosphere in a solid condition immediately beneath the loaded area. The unloading of emerged land tends by relief of pressure to produce a viscous condition of the tektosphere immediately beneath the denuded surfaces. Under the influence of the continuous shakings, tremors, and tremblings always taking place in the lithosphere the materials of the tektosphere yield to the stresses acting on them, and the deep-seated portions of the terrigenous deposits are slowly carried towards, over, or underneath the emerged land. The rocks subsequently re-formed beneath continental areas out of these terrigenous materials, under great pressure and in hydrothermal conditions, would be more acid than the rocks from which they were originally derived, and it is well known that the acid silicates

have a lower specific gravity than the intermediate or basic ones. By a continual repetition of this process the continental protuberances have been gradually built up of lighter materials than the other parts of the lithosphere. The relatively light quartz, which is also the most refractory, the most stable, and the least fusible among rock-forming minerals, plays in all this the principal *rôle*. The average height of the surface of the continents is about 3 miles above the average level of the abysmal regions. If now we assume the average density of the crust beneath the continents to be 2·5, and of the part beneath the abysmal regions to be 3, then the spheroidal surface of equal pressure—the tektosphere—would have a minimum depth of 18 miles beneath the continents and 15 miles beneath the oceans, or if we assume the density of the crust beneath the continents to be 2·5, and beneath the abysmal regions to be 2·8, then the tektosphere would be 28 miles beneath the continents and 25 miles beneath the oceans. The present condition of the Earth's crust might be brought about by the disintegration of a quantity of quartz-free volcanic rock, covering the continental areas to a depth of 18 miles, and the re-formation of rocks out of the disintegrated materials.

Where the lighter and more bulky substances have accumulated there has been a relative increase of volume, and in consequence bulging has taken place at the surface over the continental areas. Where the denser materials have been laid down there has been flattening, and in consequence a depression of the abysmal regions of the ocean-basins. It is known that, as a general rule, where large masses of sediment have been deposited, their deposition has been accompanied by a depression of the area. On the other hand, where broad mountain platforms have been subjected to extensive erosion, the loss of altitude by denudation has been made good by a rise of the platform. This points to a movement of matter on to the continental areas.

If this be anything like a true conception of the interactions that are taking place between the various geospheres of which our globe is made up, then we can understand why, in the gradual evolution of the surface features, the average level of the continental plains now stands permanently about 3 miles above the average level of those plains which form the floor of the deep ocean-basins. We may also understand how the defect of mass under the continents and an excess of mass under the oceans have been brought about, as well as deficiency of mass under mountains and excess of mass under plains. Even the local anomalies indicated by the plumb-line, gravity, and magnetic observations may in this way receive a rational explanation. It has been urged that an enormous time—greater even than what is demanded by Darwin—would be necessary for an evolution of the existing surface features on these lines. I do not think so. Indeed, in all that relates to geological time I agree, generally speaking, with the physicists rather than with the biologists and geologists.

Progress of Oceanic Research.

I have now touched on some of the problems and speculations suggested by recent deep-sea explorations; and there are many others, equally attractive, to which no reference has been made. It is abundantly evident that, for the satisfactory explanation of many marine phenomena, further observations and explorations are necessary. Happily there is no sign that the interest in oceanographical work has in any way slackened. On the contrary, the number of scientific men and ships engaged in the study of the ocean is rapidly increasing. Among all civilized peoples and in all quarters of the globe the economic importance of many of the problems that await solution is clearly recognized.

We have every reason to be proud of the work continually carried on by the officers and ships attached to the Hydrographic Department of the British Navy.

They have surveyed coasts in all parts of the world for the purposes of navigation, and within the past few years have greatly enlarged our knowledge of the sea-bed and deeper waters over wide stretches of the Pacific and other oceans. The samples of the bottom which are procured, being always carefully preserved by the officers, have enabled very definite notions to be formed as to the geographical and bathymetrical distribution of marine deposits.

The ships belonging to the various British Telegraph Cable Companies have done most excellent work in this as well as in other directions. Even during the present year Mr. R. E. Peake has in the s.s. *Britannia* procured 477 deep soundings in the North Atlantic, besides a large collection of deep-sea deposits, and many deep-sea temperature and current observations.

The French have been extending the valuable work of the *Talisman* and *Travailleur*, while the Prince of Monaco is at the present moment carrying on his oceanic investigations in the arctic seas with a large new yacht elaborately and specially fitted out for such work. The Russians have recently been engaged in the scientific exploration of the Black sea and the Caspian sea, and a special ship is now employed in the investigation of the arctic fisheries of the Murman coast under the direction of Prof. Knipowitsch. Admiral Makaroff has this summer been hammering his way through arctic ice, and at the same time carrying on a great variety of systematic observations and experiments on board the *Yermak*—the most powerful and most effective instrument of marine research ever constructed. Mr. Alexander Agassiz has this year recommenced his deep-sea explorations in the Pacific on board the U.S. steamer *Albatross*. He proposes to cross the Pacific in several directions, and to conduct investigations among the Paumotu and other coral island groups. Prof. Weber is similarly employed on board a Dutch man-of-war in the East Indian seas. The Deutsche Seewarte at Hamburg, under the direction of Dr. Neumayer, continues its praiseworthy assistance and encouragement to all investigators of the ocean, and this year the important German Deep-sea Expedition, in the s.s. *Valdivia*, arrived home after most successful oceanographical explorations in the Atlantic, Indian, and Great Southern oceans.

The *Belgica* has returned to Europe safely with a wealth of geological and biological collections and physical observations, after spending, for the first time on record, a whole winter among the icefields and icebergs of the antarctic. Mr. Borchgrevink in December last again penetrated to Cape Adare, successfully landed his party at that point, and is now wintering on the antarctic continent. The expeditions of Lieut. Peary, of Prof. Nathorst, of Captain Sverdrup, and of the Duke of Abruzzi, which are now in progress, may be expected to yield much new information about the condition of the Arctic ocean. Mr. Wellman has just returned from the north of Franz Josef land, with observations of considerable interest.

Some of the scientific results obtained by the expeditions in the Danish steamer *Ingolf* have lately been published, and these, along with the results of the joint work pursued for many years by the Swedes, Danes, and Norwegians, may ultimately have great economic value from their direct bearing on fishery problems, and on weather forecasting over long periods of time.

Largely through the influence of Prof. Otto Pettersson an International Conference assembled at Stockholm a few months ago, for the purpose of deliberating as to a programme of conjoint scientific work in the North sea and northern parts of the Atlantic, with special reference to the economic aspect of sea-fisheries. A programme was successfully drawn up, and an organization suggested for carrying it into effect; these proposals are now under the consideration of the several States. The Norwegian Government has voted a large sum of money for building a special vessel to conduct marine investigations of the nature recommended by this

conference. It is to be hoped the other North sea powers may soon follow this excellent example.

The various marine stations and laboratories for scientific research in all parts of the world furnish each year much new knowledge concerning the ocean. Among our own people the excellent work carried on by the Marine Biological Association, the Irish Fisheries Department, the Scottish Fishery Board, the Lancashire Fisheries Committee, the Cape and Canadian Fisheries Departments, is well worthy of recognition and continued support. Mr. George Murray, Mr. H. N. Dickson, Prof. Cleve, Prof. Otto Pettersson, Mr. Robert Irvine, and others have, with the assistance of the officers of the Mercantile Marine, accumulated in recent years a vast amount of information regarding the distribution of temperature and salinity, as well as of the planktonic organisms at the surface of the ocean. The papers by Mr. H. C. Russell on the icebergs and currents of the Great Southern ocean, and of Mr. F. W. Walker on the density of the water in the Southern Hemisphere, show that the Australian colonies are taking a practical interest in oceanographical problems.

Proposed Antarctic Explorations.

The great event of the year, from a geographical point of view, is the progress that has been made towards the realization of a scheme for the thorough scientific exploration in the near future of the whole South Polar region. The British and German Governments have voted or guaranteed large sums of money to assist in promoting this object, and princely donations have likewise been received from private individuals, in this connection the action of Mr. L. W. Longstaff in making a gift of £25,000, and of Mr. A. C. Harmsworth in promising £5000, being beyond all praise.

There is an earnest desire among the scientific men of Britain and Germany that there should be some sort of co-operation with regard to the scientific work of the two expeditions, and that these should both sail in 1901, so that the invaluable gain attaching to simultaneous observations may be secured. Beyond this nothing has, as yet, been definitely settled. The members of the Association will presently have an opportunity of expressing their opinions as to what should be attempted by the British Expedition, how the work in connection with it should be arranged, and how the various researches in view can best be carried to a successful issue.

I have long taken a deep interest in antarctic exploration, because such exploration must necessarily deal largely with oceanographical problems, and also because I have had the privilege of studying the conditions of the ocean within both the arctic and antarctic circles. In the year 1886 I published an article on the subject of Antarctic Exploration in the *Scottish Geographical Magazine.* This article led to an interesting interview, especially when viewed in the light of after events, for, a few weeks after it appeared in type, a young Norwegian walked into the *Challenger* office in Edinburgh to ask when the proposed expedition would probably start, and if there were any chance of his services being accepted. His name was Nansen.

When at the request of the President I addressed the Royal Geographical Society on the same subject in the year 1893, I made the following statement as to what it seemed to me should be the general character of the proposed exploration: "A dash at the South Pole is not, however, what I advocate, nor do I believe *that* is what British science at the present time desires. It demands rather a steady, continuous, laborious, and systematic exploration of the whole southern region with all the appliances of the modern investigator." At the same time I urged further, that these explorations should be undertaken by the Royal

Navy in two ships, and that the work should extend over two winters and three summers.

This scheme must now be abandoned, so far at least as the Royal Navy is concerned, for the Government has intimated that it can spare neither ships nor officers, men nor money, for an undertaking of such magnitude. The example of foreign powers—rather than the representations from our own scientific men—appears to have been chiefly instrumental in at last inducing the Government to promise a sum of £45,000, provided that an equal amount be forthcoming from other sources. This resolve throws the responsibility for the financial administration, for the equipment, and for the management of this exploration, on the representative scientific societies, which have no organization ready for carrying out important executive work on such an extensive scale. I am doubtful whether this state of matters should be regarded as a sign of increasing lukewarmness on the part of the Government towards marine research, or should rather be looked on as a most unexpected and welcome recognition of the growing importance of science and scientific men to the affairs of the nation. Let us adopt the latter view, and accept the heavy responsibility attached thereto.

Any one who will take the trouble to read, in the *Proceedings* of the Royal Society of London, the account of the discussion which recently took place on "The Scientific Advantages of an Antarctic Expedition," will gather some idea of the number and wide range of the subjects which it is urged should be investigated within the antarctic area; the proposed researches have to do with almost every branch of science. Unless an earnest attempt be made to approach very near to the ideal there sketched out, widespread and lasting disappointment will certainly be felt among the scientific men of this country. The proposed expedition should not be one of adventure. Not a rapid invasion and a sudden retreat, with tales of hardships and risks, but a scientific occupation of the unknown area by observation and experiment should be aimed at in these days.

I have all along estimated the cost of a well-equipped antarctic expedition at about £150,000. I see no reason for changing my views on this point at the present time, nor on the general scope of the work to be undertaken by the proposed expedition, as set forth in the papers I have published on the subject. There is now a sum of at most £90,000 in hand, or in view. If one ship should be specially built for penetrating the icy region, and be sent south with one naturalist on board, then such an expedition may, it will be granted, bring back interesting and important results. But it must be distinctly understood that this is not the kind of exploration scientific men have been urging on the British public for the past fifteen or twenty years. We must, if possible, have two ships, with landing parties for stations on shore, and with a recognized scientific leader and staff on board of each ship. Although we cannot have the Royal Navy, these ships can be most efficiently officered and manned from the Mercantile Marine. With only one ship many of the proposed observations would have to be cut out of the programme. In anticipation of this being the case, there are at the present moment irreconcilable differences of opinion among those most interested in these explorations, as to which sciences must be sacrificed.

The difficulties which at present surround this undertaking are fundamentally those of money. These difficulties would at once disappear, and others would certainly be overcome, should the members of the British Association at this meeting agree to place in the hands of their president a sum of £50,000, so that the total amount available for antarctic exploration would become something like £150,000. Although there is but one central Government, surely there are within the bounds of this great empire two more men like Mr. Longstaff. The Government

has suddenly placed the burden of upholding the high traditions of Great Britain in marine research and exploration on the shoulders of her scientific men. In their name I appeal to all our well-to-do fellow-countrymen in every walk of life for assistance, so that these new duties may be discharged in a manner worthy of the empire and of the well-earned reputation of British science.

THE MONTHLY RECORD.

EUROPE.

Proposed New Map of France.—An agitation has lately been set on foot in France for the execution of a new map of that country on the scale of 1 : 10,000. The question has been discussed, under the auspices of the *Service Géographique de l'Armée*, by Colonel Berthaut, while the Paris Academy of Sciences has also interested itself in the matter. The *Comptes Rendus* of that body for June 26 last contains the report, presented by M. de Lapparent, of the committee appointed to consider the question. It is now eighty-two years, the report states, since the resolution was taken to prepare a map of France "meeting all the requirements of the public services," but obstacles of all kinds have prevented the realization of the project. The existing military map, however excellent, is quite inadequate to meet the various demands of the nation in connection with public works of all kinds, for which special surveys are again and again necessary. No smaller scale than that proposed (1 : 10,000) would enable all the details of the topography to be inserted in their true proportion, and science especially suffers from the insufficiency of the existing map. Geology in particular demands a map on which all details of surface and relief, however complicated, can be clearly shown, and the same need is felt in the case of agricultural science. Lastly, it is pointed out that the newly arisen science of physical geography has everything to gain from the possession of a good map, by means of which the various forms of surface can be properly analyzed and their history elucidated; while the present seems a particularly propitious time for undertaking the work, owing to the existence of a suitable agency in the *Service Géographique de l'Armée*. The conclusions of the report having been adopted, a deputation from the Academy waited on the Minister of War, who expressed his sympathy with the project.

Bathymetrical Observations in the Italian Lakes.—We learn from the June number of the *Bollettino* of the Italian Geographical Society, that a bathymetrical survey of the lakes of Como, Mezzola, Garlate, and Olginate has lately been carried out by Dr. G. de Agostini. The result of a large number of soundings in the Lake of Como was to give the maximum depth as 410 metres (1345 feet), at a point nearly a mile south of the *Punta della Cavagnola*, and a quarter of a mile from the shore opposite the village of Nesso. This depth compares with a maximum of 1220 feet in the case of Lake Maggiore, 1134 feet for the Lake of Garda, 944 feet for that of Lugano, and 820 for that of Iseo, so that the Lake of Como is the deepest of the Italian lakes, and is only surpassed in Europe by those of Hornisdalsvand (1593 feet) and Mjösen (1476 feet), in Norway. The abysmal temperature of Como was found to be 6° C. (42°·8 Fahr.). The maximum depths of the three small lakes of Mezzola, Garlate, and Olginate are, respectively, 226, 111, and 57 feet, and the corresponding bottom temperatures 43°·3, 47°·6, and 48° Fahr.

Mr. Howell's Journey across the Láng Jökull, Iceland.—Mr. F. W. W. Howell writes to us from the west coast of Iceland, under date August 23, announcing that the first crossing of the Láng Jökull was successfully accomplished by his

party on the 2nd, 3rd, and 4th of the month. Accompanied by Messrs. Stoughton-Holborn and Barrett, both of Merton College, Oxford, and by two Icelanders, Jónas and Erlendur of Reykjavik, Mr. Howell left Kalmanstunga on August 1, and early the following day reached Flosaskart, between Eroeks Jökull and Láng Jökull. Here two sledges were put together and packed, and, with the help of a pony for part of the distance, were dragged up the ice towards the summit ridge, where camp was pitched at an altitude of 5000 feet. The night was superb, peaks rising on all sides like islands from an ocean of cloud beneath. The direction so far had been south-east, but the next morning a start was made north-east, the crest of the Jökull being followed all day, and camp again pitched on the ice near a small tufa peak north of Hvítárvatn. This was surrounded on all sides but the north-north east by a deep ice-moat, with almost perpendicular walls, the inner ones being the tufa cliffs of the hill. During the day the views extended from Snæfells Jökull to Vatna Jökull, 100 miles each way. On the 4th the travellers passed through a portal of twin rocks, and descended to a sea of ice north of Hvítafell, which is joined by a narrow ridge to Láng Jökull. The glacier was left at Fagrahlið, the passage off it being, owing to crevasses and the abrupt slope, the only part of the journey which involved serious difficulty.

ASIA.

Final Results of the Dutreuil de Rhins Mission in Central Asia.*—The third volume of M. Grenard's important work on the results of his journey with M. de Rhins in Central Asia, consists of various memoirs on historical and archæological questions, and—most important of all from a geographical point of view—a clear summary of the principal physical facts relating to the countries visited by the expedition. Although the author regrets that the death of M. de Rhins has made it impossible to present such an accurate sketch of the physical geography of the region as might otherwise have been the case, the publication of the work, and especially of the excellent atlas of maps which accompanies it, certainly marks an important advance in our knowledge of Central Asian geography. M. Grenard devotes special attention to the orography of the vast region south of Turkestan, stretching from Leh to Sining and from Khotan to Lhasa, and although much detail remains to be filled in, he considers that we now possess a good general idea of the main facts of the subject. He describes in turn the Altyn (or Astyn) Tagh, the great northern range which extends from the Pamirs to the Chinese province of Honan; the Ustun or Arka Tagh, which may be regarded as a continuation of the Karakoram; and a series of seven less-known chains south of the Ustun Tagh, which seem to have a general east-and-west direction, and of which the last runs south of Lake Tengri Nor. From a hydrographical point of view this last plays an analogous part with the Ustun Tag, as the two chains form the north and south limits of the assemblage of small lacustrine basins which lies between them. In the same way the Altyn Tagh is to be regarded as the counterpart of the Himalaya. The two interior chains are, properly speaking, the highest in Central Asia and in the whole world, for, although certain peaks in the Himalaya are more elevated, the passes are decidedly lower. M. Grenard's description of the hydrography of Turkestan and Tibet is also of much interest, especially with regard to the hitherto almost unknown upper courses of the Yang-tse and Mekong. The Chinese maps of both of these streams are very defective, and many modifications have been introduced by M. Grenard's surveys. While discussing the streams of

* 'Mission Scientifique dans la Haute Asie,' Troisième Partie. Paris: Leroux. 1898.

Eastern Turkestan, he holds that the changes which the plain has undergone are chiefly due to the action of the waters, and of the material which they carry, together with a diminution of humidity, though the effects of this last have, he thinks, been greatly exaggerated. A series of sketches by M. de Rhins, reproduced in facsimile, throw much light on the topography of the route, while the results of the journey as regards geology, botany, hypsometry, and other branches of science, are given in appendices.

The Morphology of the Tian-Shan.—A careful study of the morphology of the Tian-Shan is contributed by Dr. M. Friederichsen to the *Zeitschrift* of the Berlin Society, the first part appearing in the first number of that publication for the present year. While recognizing, with Richthofen, the connection which exists between the Tian-Shan proper and the Altai on the one hand, and the Alai-Pamir and Hindu-kush on the other, the writer subjects to a scientific analysis only the central part of the great system, with regard to which his aim is to present a view of its horizontal and vertical composition, as well as of its hydrographical, geological, and climatic relations; the attempt being justified, in his opinion, by the great bulk of material in the Russian language not yet worked up and not accessible to the great body of students. After a useful summary of the work of scientific explorers in the Tian-Shan, Dr. Friederichsen proceeds to sketch the general characteristics of the range, before dealing at length with the horizontal disposition of its component parts. The most marked feature is, he says, the regularity which prevails as regards the direction and arrangement of the separate chains, the mean direction of which may be taken as from west by south to east by north, the gentle curvature observable in a general view of the Tian-Shan being due to the influence of neighbouring ranges running in from the north-west. These general features make their influence felt in many ways, determining the directions of streams, and affecting also the course of human history within the range. In the angle formed by the meeting of the two directions settlements find shelter, while by widening out in the west into a series of parallel chains the range favours communication, just as it hinders the same where united into an unbroken wall in the east. We cannot here follow the writer in his detailed analysis of the range, but his conclusions may be briefly alluded to. The existence of *two* directions diverging in opposite ways from an east-to-west line is, he says, plainly recognizable; the one varying from E. by N. to (rarely) N.E., the other from W. by N. to (frequently) N.W. The direction which dominates the range as a whole (W. by S. to E. by N.) prevails especially in the west, while in the east one from W.N.W. to E.S.E. predominates. This fact supplies the basis for a division of the Tian-Shan into an eastern and a western half, meeting each other at an angle, the dividing line running along the Ili and Kunges valleys and south to the Tarim at Kucha. In spite of difference in internal structure, the two sections present some marked analogies in external form. Dr. Friederichsen concludes his first instalment by noting the existence of curves due to the fusion of chains with different directions. The orography of the range is shown on an excellent map, over which, for the sake of clearness, the network of travellers' routes is given separately on transparent paper.

The Aborigines of Formosa.—A society was formed last year at Tamsui for the comprehensive study of the aborigines of Formosa and their habitat, by means of journeys into the interior and the publication of memoirs on the subject. Several such have already appeared from the pen of a Japanese named Ino Kakyo, and one of them is reproduced in German in a recent number of the *Zeitschrift* of the Berlin Geographical Society. The writer begins by attempting a division of the Formosan aborigines into groups and tribes, defining four of the former and eight of the latter (with subordinate divisions), on the basis of their physical and

moral characteristics. This subdivision is, he says, of a character subordinate to the idea of "race" or "branch," it being probably possible, by a study of the common characteristics of the people in question, to refer them all to a single such category. The greater part of the paper is taken up with a discussion of the present position of the Formosans in the scale of civilization, the differences observable in this respect being, the writer holds, not original, but acquired during the process of development. He finds that considerable progress has been made in the development both of intelligence and of moral sense, as well as of the religious idea, and concludes that the Formosans are by no means at the lowest stage of culture. Their civilization will depend on the care which is taken to avoid arbitrary measures, and gradually educate them up to the reception of new ideas. Due regard being paid to these points, there is no necessity, the writer thinks, that they should share the fate of the Tasmanians and other primitive tribes which have felt the fatal influence of contact with civilization.

AFRICA.

Mr. Codrington's Expedition.—We have received the concluding portion of Mr. Codrington's journal kept during his expedition to Livingstone's tree, of which some account was given in our last number. Before leaving the spot on which the tree had stood, a fence was built round the stump, and all trees cleared away for 60 yards round, while a sealed bottle was buried within the enclosure. On May 14 the return journey was commenced, the Lulimalu river being crossed and the march continued across dry grassy "dambos," alternating with ridges or belts of trees. During the next few days a number of rivers flowing to the Luapula, Bangweulu, and the Chambezi were crossed. Of these the Lokulu was a strong deep stream, 350 yards wide, while the Lolingela was 1000 yards wide. On May 18 the Chambezi was reached, and descended for 7 miles to the confluence of the Lolingela, which runs in from the south, the Chambezi afterwards turning northwards. Soundings in the latter gave a depth of 19 to 20 feet. Before reaching Bangweulu the open water ceases, there being only canals for canoes through the grass. At Chirabe island also there is no open water to the east or south-east. Observations for altitude at the camp on the Chambezi gave as result 3791 feet. On May 20 the expedition began ascending the Chambezi, which had a current of 1½ mile an hour; but on the 22nd the boats were sent up the Chambezi and Lukulu, while Mr. Codrington proceeded overland through the Awemba country. Many streams were crossed, and on the 24th the country was well wooded, with small villages every few miles. At Kasama (4246 feet by mean of seven boiling-point observations) an "indaba" was held in the presence of several Europeans then in the place, and a successor to the chief Mwamba appointed. On the 30th the borders of Ketiamkulu's territory were reached. During the latter part of the day the country was uninhabited, with a splendid timber belt and outcrops of stratified rocks. The Chambezi was again struck on June 1, it being then 30 yards wide with steep banks, and two days later its tributary the Chozi was crossed. On June 4 the station of Ikawa was reached, the mean of ten observations giving its altitude as 5279 feet.

Dr. Pleyn's Explorations in the Congo Basin.—News of the expedition recently sent out by way of the Congo to the south-east corner of the Cameroons territory appears in the *Deutsches Kolonialblatt* for August 1. After superintending the construction of a station on the bank of the Ngoko, within the German sphere, Dr. Pleyn set out on April 28 last to explore the upper course of that river (the western branch of the Sanga), which for a certain distance forms the boundary between French and German territory. After passing one or two villages of the Misanga, an entirely uninhabited district, traversed only by hunting-parties,

was entered. On May 1, Dr. Pleyn reached the confluence of the Bumba and the Ja, which, coming from the north and west respectively, unite to form the Ngoko. The Ja is, however, decidedly the more important of the two, being about 150 yards wide at its mouth, while the Bumba is only about 100. The latter, which was first explored, is a very rapid stream, and rapids were encountered at which it was necessary to unload the canoes, progress being at last entirely stopped by a cataract in about 2° 30′ north, 14° 30′ east. Before this, villages of the Kunabembe had been visited, at which the travellers received a friendly reception. On May 6 the ascent of the Ja was commenced. Beyond the last settlement of the Misanga and four small villages of the Bomabassa, Dr. Pleyn passed for four days through quite uninhabited country, which became more and more mountainous, the river winding between hills and ridges covered with dense forest, and rising to a height of over 2000 feet above its banks. On May 14 a lake-like expansion surrounded by mountains was reached, into which the Ja poured itself through a narrow gorge containing several rapids. This proved the limit of navigation, though the stream was examined on foot above the gorge, where it again widened out to 150 yards. From the rapids (the position of which is roughly estimated as in 7° 30′ north, 13° 40′ east) to the embouchure of the Ngoko into the Sanga, the stream is navigable even for the larger river steamers, its bed being cut deeply in rocky ground. The Bumba is less favourable, as steamers could not ascend more than about 13 miles above its mouth. The whole country is covered with primeval forest, in which rubber abounds, but the oil-palm occurs only singly. Elephants are very numerous. According to native information, very long distances have to be traversed beyond the rapids on the Ja and Bumba before any settlements are reached. Even on the lower courses of the rivers population is extremely scanty. Besides the Misanga, most of the tribes met with are classed under the common designation Nzimu, or bush-dwellers, who avoid the immediate vicinity of the rivers, and are said to be undoubtedly related to the Fan. There are also tribes of wandering elephant-hunters, without fixed habitations, known as Badyiri, Bakollo or Bayaka, under which last name they were met with by Crampel two degrees further west. At the time of writing, Dr. Pleyn was about to proceed to Nzimu, on the Sanga.

West African Rubber.—A mission to West Africa for the study of the rubber plants of that region and their cultivation has been entrusted by the committee on Colonial Agriculture in Berlin to Herr Schlechter, who in the *Deutsches Kolonialblatt* for August 1 describes his visit to Lagos and the Cameroons in prosecution of his inquiries. During an excursion in the interior of Lagos he collected samples of the *Kicksia* milk and seeds of the tree for introduction into the Cameroons. The forests in which it once abounded now possess but few of the trees, and Herr Schlechter considers that its day is over in Lagos, unless efficient measures for its propagation are taken by the authorities. The order lately issued forbidding it to be touched for four years must, he says, be ineffectual owing to the absence of adequate control. Herr Schlechter discovered an apparently new species of *Ficus* in Lagos, which yields rubber of a fair quality, but which it would not pay, according to an expert who has examined the product, to cultivate in plantations. The species of *Kicksia* are, however, in Herr Schlechter's opinion, especially suited for cultivation, as they appear to grow best in thick forest, and therefore the complete clearing of the ground is unnecessary when forming a plantation.

The Harmattan in Upper Guinea.—Although the phenomenon of the Harmattan has long been familiar as a characteristic of North-West Africa, it was only since the inauguration, within recent years, of regular meteorological observations in the interior of the country, that any accurate conclusions could be

drawn as to its causes. Considerable space is devoted to the subject, as elucidated by such observations, in the first number of the *Mitteilungen aus den Deutschen Schutzgebieten* for the current year, in which Drs. Gruner and Mischlich and Lieut. von Seefried severally discuss the question, while Prof. V. Danckelman sums up the conclusions to which he is led personally from an examination of the data. While the general idea has been that the Harmattan is a hot wind blowing from the Sahara, Drs. Gruner and Mischlich deny its connection with the desert. The former gives as the chief meteorological characteristics of the dry season in the interior: (1) Continuous east, north, and north-east winds; (2) continuous great, but varying, dryness of the atmosphere; (3) perpetual haze; (4) occasional great falls of temperature by night. The *régime* of the winds is, he holds, due merely to the position of the region relatively to the sea and the continental steppe, and he accounts for the dust which fills the air by the influence of ascending currents, on which Dr. Mischling also lays stress. The phenomena of the Harmattan are therefore due, in Dr. Gruner's opinion, to the existence of extreme dryness in regions with a prevailing steppe character. Dr. von Danckelman is inclined to dissent from these views, which rest on the assumption that the atmospheric haze (a characteristic of the whole dry season) is the central phenomenon in the Harmattan. This may be justified on etymological grounds, but the problem as generally understood consists in accounting for the irregular recurrence of periods of excessive dryness, coinciding with remarkably low morning temperatures. The latter are probably due to excessive nocturnal radiation, but the connection of this with the dryness of the atmosphere is not so obvious. From a study of the observations, Dr. von Danckelman concludes that periods of dryness and low temperature occur only when a northerly direction of the wind predominates, and that the Harmattan in the narrower sense is therefore due to a temporary intensification of the conditions of wind which prevail in the western Sudan at this season. The excessive dryness is due to the nature of the countries north of the Niger, while to be charged with dust is probably a general characteristic of the winds of the region at the season in question.

Geological Exploration in German East Africa.—An expedition under Dr. Dantz has lately carried out an extensive journey in German East Africa, for the purpose of geological research, returning to Dar-es-Salaam in April last. The main results are briefly stated in the *Deutsches Kolonialblatt* for June 1. The expedition traversed the whole country as far as the Victoria Nyanza, the turning-point being the mountainous country of Shashi, north-east of Speke gulf. The southern edge of this district, which falls steeply to the Kuwaua (Ruwana?) river, is marked by an important line of disturbance, which is continued on the south side of the Kiruwiru range and of Ukerewe island. In South Shashi the prevailing rock is a reddish granite or gneiss, while further north the ferruginous schists which elsewhere have been found to contain gold attain an unusual development. Further south, in an uninhabited tract east of Ntussu, which was traversed for the first time during the return march, similar schists with quartz and diabase form continuous ranges, interposed between the plateau lands on either side. Water is apparently to be found there during the greater part of the year. The great uninhabited "Pori" west of Lake Eyassi seems to be an unbroken zone of gneiss. Its surface is much cut up by the beds of streams. The Wembere-Eyassi trough is not sharply defined to the north of the Simbiti river, except in the vicinity of the lake, but its southern edge is well marked. The great East African rift-valley is particularly well marked to the west in Ussandaui and Ungenganya, though its eastern edge is masked by the Irangi mountains. Very little rain falls here, by reason of the higher ground which intercepts it on either side. The Mkata plain east of Kilossa is regarded

as equally due to subsidence, its walls running from south-west to north-east. Dr. Dantz has also defined the geological formations nearer the coast, and studied the agricultural capabilities of the various districts. These depend almost entirely on the amount of precipitation, and this is most favourable, Dr. Dantz considers, west of Ugogo as far as the lakes.

Journey to Bauchi, Nigeria.—The report of a journey made last year from Ibi, on the Benue, to Bauchi (Yakoba), for recruiting purposes, by Lieuts. Bryan and Macnaghten, lately issued by the Colonial Office, contains some details of interest as to the present state of the country. Starting from Ibi on June 15, with a caravan of 138 carriers, the two officers left the Benue at Amara on the 23rd, and proceeded *viâ* Gatari (about 2000 inhabitants), through a country hilly or rocky in places, and generally covered with short scrub, with patches of cultivation. Of the rivers crossed, the Gende, 250 yards wide, in two channels, with a current of 3 miles an hour, was the most important. Bauchi was reached on July 13. It has a good wall, with banquette and ditch, and probably contains 20,000 inhabitants. An interview with the Emir was obtained, but the people were somewhat suspicious, and only after some hesitation was permission given to enlist recruits, while steps were afterwards taken to nullify the permission. The want of confidence experienced is ascribed by Lieut. Bryan to ignorance of the white man. Bauchi has a good market, and Manchester goods were fairly plentiful, but seemed to have come across the desert from Tripoli, more than from Ibi. On the return journey the caravan, after crossing the Gende (a work of some time, owing to a rise in its level), traversed the Missu country, being well received at Maimadi, a large walled town of 6000 inhabitants (Hausa and Fulani). Ako, a strong independent town of 8000 inhabitants, was also visited. The caravan routes are much infested by pagan tribes occupying tracts of hilly country in their vicinity, one of them—the Tangele—being cannibals. Information was also collected respecting other pagan tribes on the Benue. Lieut. Bryan thinks time will be required to foster legitimate trade, though the agricultural wealth of Bauchi and Missu is considerable. Tin is obtained near Bauchi, and iron is smelted in many places.

AMERICA.

The First Discovery of the Madre-de-Dios.—A document of some interest to historical geographers has recently been published at Seville by Señor Luis Ulloa. It is printed from a manuscript which exists in the 'Archivo general de Indias,' describing the expedition of the conquistador Juan Alvarez Maldonado, in 1567, from the Peruvian cordillera into the Amazonian forests, respecting which very little has yet been published. The *Relacion* is not the work of Maldonado himself, but of one of his companions—possibly, the editor thinks, the pilot Hernando Alonso. The authenticity of the manuscript, he says, admits of no question, and the precision of the geographical data, judged in the light of modern knowledge, is surprising. Señor Ulloa credits Maldonado with the discovery of the whole course of the Amaru-mayu or Madre-de-Dios, and even identifies one of the streams mentioned in the *Relacion* with the Beni. The Madre-de-Dios itself is named the Manu, which name coincides with that of one of its headwaters explored a few years ago by Señor Fiscarrald (*Journal*, vol. vii. p. 189). Other names of tributaries agree with those now in use, and the old account also mentions the Araonas, Toromonas, Guarayos, and other tribes met with by recent explorers on the Madre-de-Dios. The editor gives a short sketch of the career of Maldonado, and also of the journeys made by his predecessors in the Amazonian forests. He holds that Garcilasso's account of the descent of the Amaru-mayu by the Inca Yupanqui is untrustworthy, and that that writer confounded a real expedition of the Incas to the Moxos of the

Beni with that of Maldonado to the Madre-de-Dios. The Spanish captains Pedro de Candia and Pero Anzures de Camporredondo explored the country south of the latter stream, and none of the missionaries who visited the Araonas and Chunchos before Maldonado's time seem to have reached its waters; so that the credit of the discovery, Señor Ulloa holds, belongs to the last-named captain. It seems open to question, however, whether Maldonado really advanced eastward so far as Señor Ulloa supposes.

POLAR REGIONS.

Return of the "Windward."—The arrival of the *Windward* at Brigus in Conception bay, Newfoundland, was announced by telegram from St. John's on September 10. News was brought by the ship regarding the expeditions both of Peary and Sverdrup, neither of which appear to have yet advanced far beyond the limits of the known. During a severe storm in January, several of Peary's party suffered from frost-bite, involving the loss of toes. During the previous autumn Peary had explored the coast of Grinnell land to its western extremity, but no unexplored point in the direction of the Pole had been reached. The explorer will again winter in the far north and continue his work for three years more, if need be, the *Windward* returning north next spring. Captain Sverdrup had wintered 50 miles south of Peary. The following report, stated to be from Lieut. Peary, is published in a Christiania journal: "In the course of the winter Captain Sverdrup thoroughly explored Ellesmere land. He intends in the summer to advance as far north as possible. If it is not possible to get away further with his ship he will go by sledge on land with a portion of his party, and follow a part of the coast of Greenland hitherto untrodden northwards and eastwards as far as Independence bay, where he hopes to be picked up by the *Fram* in a year or possibly two. He intends in the autumn to send the *Fram* round Cape Farewell and up the east coast, where, as already stated, he proposes to meet her."

Dr. Nathorst's Expedition to East Greenland.—During September the *Antarctic* with Dr. Nathorst's party on board arrived at Malmö from the east coast of Greenland. No trace of Andrée had been found, but good exploring work had been accomplished, many new inlets being discovered and charted in the neighbourhood of Franz Josef Fjord. Valuable ethnographical results were also obtained respecting the now extinct Eskimo population of that region.

The Botanical Aims of South Polar Research.—A paper on this subject by Dr. F. W. Neger appears in the *Mitteilungen* of the Leipzig Geographical Society for 1898. The writer begins by pointing out that, although at first sight the antarctic lands are marked by extreme poverty in vegetable life, the fact of the existence of a comparatively extensive fauna in the coast waters proves that the flora too must there be fairly abundant. The almost entire blocking of the coasts by land-ice must, it is true, stand in the way of the development of a littoral flora which consists elsewhere chiefly of green *algæ*, but the second or sub-littoral zone will probably be found to possess a rich flora (brown or red *algæ*), it being well known that these organisms are able to flourish in spite of intense cold, while in the north they have been found to depths of 150 fathoms, below the disturbing influence of the land-ice. A wide field is also open for the investigation of the *Plankton* of the southern seas, as also of the distribution of the marine flora and the manner in which this is affected by variations of salinity. A number of most interesting problems depend for their solution also on a knowledge of the past and present land-flora of the Antarctic. In view of the surprising contrasts presented by the botany of the southern hemisphere, it is by no means impossible that vascular plants may be discovered within the fringing ice-wall, it being probable that isolated

spots may be free from ice owing to the influence of volcanic heat or other causes. Dr. Neger goes fully into the question of the former distribution of land and water and of climatic changes in the Antarctic, showing the great interest, in this connection, which would attach to the discovery of fossil forms of vegetation. He points out the grounds for believing that the antarctic continent was once more suited than at present for the growth of plants, and that this may explain the strange admixture of forms between South America, Australia, and other southern lands. The similarity of the flora of Kerguelen Land, Marion island, and Heard island, separated as they are by wide tracts of ocean, may be also explained, he thinks, by the supposition that the plants were transported by drift-ice from the Antarctic. As regards the former changes of climate which may have taken place in the southern hemisphere, Dr. Neger remarks that any remains of plants that may be found in the Antarctic must be older than the long cold period which occupied the Tertiary epoch. If at an earlier date the southern continent was covered with vegetation, the forests would probably have consisted of *Araucariæ* and other conifers of the habit of *Libocedrus* and *Podocarpus*, and of foliage trees such as *Nothofagus*.

Danish Expedition to East Greenland.—We have already * given some information about an expedition to the unexplored part of the east coast of Greenland between Angmagsalik (65¾° lat.) and Scoresby sound (70°) under command of Lieut. Amdrup, R.D.N. The expedition, which left Copenhagen in August, 1898, for Angmagsalik, returned on September 12 last, and has carried out the first part of its plan, exploring the coast up to 67½° with boat and dog-sledges, and establishing two depôts at 66° 6′ and 67° 15′. At the last place the expedition found the remains of a small extinct Eskimo settlement of about thirty persons. The ethnographical remains found here are interesting, and the expedition has, during its sojourn in Greenland, made different scientific observations concerning botany, zoology, magnetism, etc. The lowest temperature was −30° Celsius (−22 Fahr.). The expedition consisted of the leader, Ch. Kruse, botanist and geologist; K. Pontsen, zoologist; S. Jacobsen, a naval petty officer; and Nielsen, sailor and smith. The second part of the work of the expedition (which will probably start next year) consists in an exploration of the coast from Scoresby sound southwards, after which the expedition will return *viâ* Angmagsalik, a Danish mission and trading station, to which the government sends a ship every year in August.

GENERAL.

A New Ethnological Text-book.† — Under the title 'Man: Past and Present,' Mr. A. H. Keane contributes a new volume to the *Cambridge Geographical Series*, intended to supplement his 'Ethnology,' which appeared as the first issue of that series. Whereas the latter dealt mainly with general questions relating to the human race as a whole, the new volume is intended rather as a systematic account of the four principal divisions into which mankind is divided by the author, with especial reference to their geographical habitats, and to the subject of the origin and inter-relations of the different subordinate groups. It is, therefore, quite complete in itself, though reference is constantly made to the earlier volume, in which fundamental questions have been more fully treated. As a guide to the present state of knowledge on the various branches of the human family, their social institutions and religious ideas, the new volume supplies a long-felt want, and is a monument of comprehensive acquaintance with the results of modern research, and with the vast body of facts which have been collected on the subject.

* Vol. x. p. 18.

† 'Man: Past and Present.' By A. H. Keane, F.R.G.S. Cambridge University Press. 1899.

As a text-book it is perhaps somewhat too much a statement of the author's personal views on controverted points, contrary opinions being often rather summarily dismissed. The distinction between "reasonable assumptions" and positive facts is also, perhaps, not always kept up as clearly as might be wished. The main conclusions of the author have already been put before students in his earlier volume, and need not be repeated at length here. They all rest on the belief that the world was peopled from one eastern centre during Pleistocene times, and that the primary groups were already specialized before the Neolithic epoch, or, according to Mr. Keane's ideas, at least 100,000 years ago. The results of some recent researches, which have appeared since the date of the 'Ethnology,' have, however, been embodied. Thus, Prof. Sergi's important work on the Hamitic race has been utilized and its conclusions in the main accepted, together with those of other inquirers in the same field, which point to the ethnic unity of the Berbers and of the peoples which form the basis of the south European populations. This has, of course, an important bearing on the question of the European races generally, which are divided by Mr. Keane (with De Laponge and Ripley) into three primary groups, characterized briefly as tall, blonde long-heads; short, dark long-heads; and brown round-heads. As the designation for the primary division to which all these, as well as the Semites, etc., belong, he vigorously defends the old term Caucasic, which, he says, possesses the valuable quality of prestige, and is certainly open to no more objections than Semitic or Hamitic. The original home of the Caucasic peoples Mr. Keane places in North Africa, that of the Mongolians in Tibet, while no such restricted areas are assigned as the primæval homes of the American aborigines and the Negroes. As elsewhere, Mr. Keane draws a decided line of partition between the Sudanese and the Bantu negroes, while classing the latter with the Hottentots, Bushmen, and Negritoes. Yet he allows that, physically, no hard and fast line can be drawn between the Sudanese and Bantu. With regard to the Malagasy problem, which he considers to have been somewhat needlessly revived of late years, the author lays stress on the very early date of the original Malay immigration, which, he says, is no matter of speculation, but a direct inference from established facts. Enough has been said to show the varied nature of the questions discussed, and, however they may dissent from the views of the author, all readers of his book will find abundant matter to stimulate their interest. There is a useful series of illustrations, from photographs, of the various types described.

The Science of Map-making.—In a recent publication of the Maryland geological survey, Mr. Henry Gannett gives a succinct and clear exposition of the aims and methods of cartography, with special reference to the topographic maps now under construction in Maryland. A large part of the paper is, of course, taken up with technical details as to the methods and instruments employed; but the introductory matter, dealing with general principles and desiderata to be kept in view in map-making, is of wider interest. Mr. Gannett distinguishes between "geographic maps," or those upon small scales usually compiled from others on larger scales, and "topographic maps" upon large scales, often made directly from surveys. To the latter his chief attention is directed. As regards the general methods of map-making, he remarks that every map, whatever its character, is essentially a sketch corrected by locations. The work of making a map, therefore, consists of two parts: that of making these locations, which is done by surveying-instruments, and is geometrical; and that of sketching, which is done by the eye and hand, and is artistic. The correctness of maps depends upon four elements: (1) accuracy of location; (2) the number of locations per square inch of the map; (3) their distribution; and (4) the quality of the sketching. The greatest accuracy attainable is not always desirable, but the degree of correctness must depend on the end in view. After discussing the amount of control necessary in different

cases, and the two general methods (by triangulation or traverse) of location of stations, the writer corrects a "widespread misapprehension regarding the possible accuracy of maps," showing that, owing to the amount of generalization necessary, absolutely "perfect maps" are an impossibility. In his detailed account of the methods employed, Mr. Gannett treats in turn of (1) the location of the map upon the Earth's surface by astronomical observations; (2) the horizontal location of points, in three grades of accuracy; (3) the measurement of heights; (4) the sketching of the map—by far the most important part of the work of map-making. He also describes the various instruments employed, and their mode of use.

CORRESPONDENCE.

The Khotan River.

With reference to Colonel Trotter's remarks on pages 447 and 448 of the *Geographical Journal* for April, 1899, which I have only just received, I beg to state that I am perfectly familiar with the upper waters of the Kiria river and its four chief tributaries, and that I did not mistake any of the above for the Khotan river, whose sources I discovered. The river referred to as having been crossed by Kishin Sing in lat. 35° 3′, long. 81° 30′, flows into a lake marked on sheet No. 1 of my map of Western Tibet as "lake approximately fixed," in lat. 35° long. 81°. Aksu is on the western tributary of the Kiria river, not on the main river, and the sources of the Khotan river are, roughly speaking, south-west of that place. As regards my longitudes, I do not wish to again refer to them until all my observations have been re-computed and checked. The Khotan river cannot possibly flow south for 30 miles, or anything like that distance, from its source, as a high snow range intervenes between it and the river said by Kishin Sing to flow into the Khotan river.

H. H. P. Deasy.

Leh, July 29, 1899.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.	Mag. = Magazine.
Abh. = Abhandlungen.	Mem. = Memoirs, Mémoires.
Ann. = Annals, Annales, Annalen.	Met. = Meteorological.
B. = Bulletin, Bollettino, Boletim.	P. = Proceedings.
Com. = Commerce.	R. = Royal.
C. Rd. = Comptes Rendus.	Rev. = Review, Revue.
Erdk. = Erdkunde.	S. = Society, Société, Selskab.
G. = Geography, Geographie, Geografia.	Sitzb. = Sitzungsbericht.
Ges. = Gesellschaft.	T. = Transactions.
I. = Institute, Institution.	V. = Verein.
Iz. = Izvestiya.	Verh. = Verhandlungen.
J. = Journal.	W. = Wissenschaft, and compounds.
k. u. k. = kaiserlich und königlich.	Z. = Zeitschrift.
M. = Mitteilungen.	Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Belgium—Meteorology. ——

Résumé des Observations Météorologiques faites à l'Observatoire Royal de Belgique, à Uccle pendant l'année 1898. Bruxelles, 1899. Size 7½ × 5, pp. 16. *Presented by M. A. Lancaster.*

Belgium—Sunshine. **Lancaster.**

De l'intérêt des relevés journaliers des heures de Soleil. Par A. Lancaster. Bruxelles, 1899. Size 7½ × 5, pp. 24. *Diagrams. Presented by the Author.*

On the importance of measuring the daily duration of bright sunshine with statistics of sunshine for Brussels for twelve years. A diagram is given, comparing graphically the average percentage of possible sunshine for each month enjoyed at Madrid, Rome, Uccle, Hamburg, and Ben Nevis.

Central Europe—Plants. **Schulz.**

Entwicklungsgeschichte der Phanerogamen Pflanzendecke Mitteleuropas nördlich der Alpen. Von Dr. August Schulz.—Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Elfter Band, Heft 5. Stuttgart: J. Engelhorn, 1899. Size 9½ × 6½, pp. 229-447.

Danube. *B.S.G. Română* **19** (1898): 19-36. **Sturdza.**

Lucrările Comisiuneĭ Europeane a Dunăreĭ, conferință de D. Dimitrie A. Sturdza. Rezumat în limba franceză.

The report in French of a lecture on the Danube, delivered to the Rumanian Geographical Society.

Denmark. **Boyle.**

Trade and Agriculture of Denmark for the year 1898. Foreign Office, Annual No. 2301, 1899. Size 10 × 6½, pp. 22. *Diagram. Price 2½d.*

Europe—Cartography. *Ymer* **19** (1899): 159-170. **Tottie.**

Om fortgången af Europas allmänna topografiska kartarbeten under innevarande decennium. Af Ch. D. Tottie. *With Maps.*

On the progress of the official mapping of Europe since 1889, with maps showing the present state of the topographical, geological, and marine surveys of Norway and Sweden.

Europe—Preglacial Geography. **Hildebrandt.**

Naturw. Wochenschrift **14** (1899): 261-267.

Die Westgrenze des letzten nordeuropäischen Inlandeises. Eine Diluvialstudie von Max Hildebrandt. *With Map.*

Europe—Travel. ——

London to Switzerland and Italy by the St. Gothard Railway. 100 Picturesque Views. Nancy: A Bergeret & C^ie^. Size 13 × 10. *Presented by the Compagnie des Chemins de Fer de l'Est.*

Faroe Islands. *Geolog. Mag.* **6** (1899): 308-309. **Lomas.**

Glaciated Valleys in the Faroes. By Joseph Lomas.

Faroe Islands. *G. Tidskrift* **15** (1899): 29-36. **Willaume-Jantzen.**

Færøernes Klima. Af V. Willaume-Jantzen.

France. **Babinet and Lemoine.**

Résumé des Observations centralisées par le Service Hydrométrique du Bassin de la Seine pendant l'année 1897. Par M. Babinet. Versailles, 1898. Size 10½ × 7, pp. 52 and 8.

Observations sur les Cours d'Eau et la Pluie centralisées pendant l'année 1897. . . . Par M. G. Lemoine et M. Babinet. [7 Plates.] Size 18 × 11½.

France. *B.S.G. Lille* **31** (1899): 411-428. **Cantineau.**

Les Excursions de la Société de Géographie de Lille en 1898: A travers les Vosges et le Jura. Par M. E. Cantineau. *With Illustrations.*

France. *B.S.G. Com. Bordeaux* **22** (1899): 191-199, 217-225. **Imbert.**

Quelques ports maritimes français de l'Atlantique. Par Louis Imbert.

Particulars of the capacity and equipment of the chief French seaports on the Atlantic.

France. **Lee.**

Trade of France for the year 1898. Foreign Office, Annual No. 2213, 1899. Size 9½ × 6½, pp. 30. *Price 2d.*

France—Bay of Biscay. **Odin and Rabilier.**
Carte des parages de pêche du thon dans le golfe de Gascogne. Par A. Odin et G. Rabilier.—Congrès International de Pêches Maritimes, Comptes rendus des Séances. Paris, 1899. Pp. 53–66. *Map.*

On the limits within which the fishing for the germon, or white thon (*Thymnus thymnus*), is carried on.

France—Bordeaux. **Hearn.**
Trade of Bordeaux and District for the year 1898. Foreign Office, Annual No. 2250, 1899. Size 10 × 6½, pp. 58. *Price 3d.*

France—Coasts. *B.S.G. Paris* **20** (1899): 182–197. **Thoulet.**
Considérations relatives à la construction d'une carte lithologique des côtes de France. Par M. J. Thoulet.

A proposal to construct a detailed map showing the nature of the sea-bottom off the coast of France.

France—Corsica. *Ann. G.* **8** (1899): 304–329. **Ratzel.**
La Corse. Étude anthropogéographique. Par M. Friedrich Ratzel.

France—Ushant. *Tour du Monde* **5** (1899): 289-300. **Gruyer.**
Ouessant (Enez Heussa—L'Ile de l'Épouvante). Par M. Paul Gruyer. *With Illustrations.*

Germany. ———
Siebenter Internationaler Geographen-Kongress Berlin 1899. Programm der Wissenschaftlichen Ausflüge. Berlin, 1899. Size 11½ × 9, pp. 16.

A list of the excursions planned in connection with the Berlin Geographical Congress, each being accompanied by a detailed list of books and memoirs covering most of the Baltic coast of Germany and the Rhine valley.

Germany—Bavaria. *Altbayerische Monats.* 1 (1899): 1–21. **Oberhummer.**
Ueber die Entwicklung und die Aufgaben der bayerischen Landeskunde. Von Prof. Dr. Eugen Oberhummer. *With Maps and Illustrations.*

Germany—Fichtelgebirge. *M.V. Erdk. Leipzig* (1898): 55–195. **Nüchter.**
Das Fichtelgebirge in seiner Bedeutung für den mitteleuropäischen Verkehr. Eine anthropo-geographische Studie von Friedrich Nüchter.

On the influence exercised by mountains, and especially by the Fichtelgebirge, on the lines of communication through Europe.

Germany—Fisheries. *Rev. Maritime* **140** (1899): 445, 671; **141** (1899): 197 ———
Les pêches maritimes en Allemagne. *With Illustrations.*

Germany—Hamburg. **Ward.**
Trade of Hamburg for the year 1898. Foreign Office, Annual No. 2263, 1899. Size 10 × 6½, pp. 76. *Price 4d.*

Germany—Meteorology. **Bezold.**
Veröffentlichungen des Königlich Preussischen Meteorologischen Instituts, herausgegeben durch dessen Direktor Wilhelm von Bezold. 1898. Heft ii. Ergebnisse der Beobachtungen an den Stationen II. und III. Ordnung im Jahre 1898 zugleich Deutsches Meteorologisches Jahrbuch für 1898. Berlin: A. Asher & Co., 1899. Size 13½ × 10, pp. 57–110. *Presented by the Prussian Meteorological Institute.*

Germany—Saxony. *M. V. Erdk. Leipzig* (1898): 17–53. **Hassert.**
Die geographische Lage und Entwickelung Leipzigs. Von Privatdozent Dr. Kurt Hassert.

On the geographical position of Leipzig and the development of the town.

Germany—Trade. **Oppenheimer.**
Trade of Frankfort-on-Main for the year 1898. Foreign Office, Annual No. 2312, 899. Size 10 × 6½, pp. 64. *Price 3d.*

This report deals with the trade of the German empire, the Consul-general, Sir Charles Oppenheimer, passing in review the present situation, and giving a statistical summary of the trade between the United Kingdom and Germany for ten years.

Greece—Amorgos. *B.S.R. Belge G.* **23** (1899): 90–108, 145–171. **Hautteœur.**
L'île d'Amorgos. Par Henry Hautteœur. *With Map.*

Greece—Ionian Islands. **Dupuis.**
Trade of the Ionian Islands for the year 1898. Foreign Office, Annual No. 2269, 1899. Size 9½ × 6½, pp. 20. *Price 2d.*

Europe—Hanse Towns. *B. American G.S.* 31 (1899): 236–255. **Semple.**
The Development of the Hanse Towns in Relation to their Geographical Environment. By Ellen C. Semple. *With Maps.*

Holland. *B.S.G. Lille* 31 (1899): 235–256, 381–401. **De Swarte.**
Au pays de Rembrandt et de Frans Hals. Coups de crayon sur un Carnet de voyage par Victor De Swarte.

Hungary—Lake Balaton. ——
Resultate der wissenschaftlichen Erforschung des Balatonsees. Herausgegeben von der Balatonsee-Commission der Ung. Geographischen Gesellschaft. Zweiter Band. Die Biologie des Balatonsees und seiner Umgebung. Erster Theil. Die Fauna des Balatonsees. Von Dr. Karl Brancsik, Dr. Eugen v. Daday, Raoul Francé, Dr. Alexander Lovassy, Ludwig v. Méhelij, Dr. Stefan v. Rátz, Dr. Karl Szigethy und Dr. Eugen Vángel. Wien: E. Hölzel, 1897. Size 11½ × 8½, pp. xl. and 280. *Illustrations. Presented by the Hungarian Geographical Society.*

Iceland. *G. Tidskrift* 15 (1899): 3–14. **Thoroddsen**
Højlandet ved Langjökull paa Island Rejseberetning fra Sommeren 1898 af Dr. phil. Th. Thoroddsen. *With Map.*

This memoir is accompanied by a geological map of the belt of country between Hunafloi and Faxafjord.

Iceland. **Vidalin.**
Trade of Iceland for the years 1895–98. Foreign Office, Annual No. 2285, 1899. Size 10 × 6½, pp. 18. *Price* 1½*d.*

Italy. *B.S.G. Italiana* 12 (1899): 249–256. **Baratta.**
Alessandro Volta ed i suoi studi sulle fontane ardenti di Pietramala e di Velleja. Notizie del Socio M. Baratta.

Italy—Elba. **Toniotti.**
Trade of the Island of Elba for the year 1898. Foreign Office, Annual No. 2274. 1899. Size 9½ × 6½, pp. 12. *Price* 1*d.*

Italy—Emigration. *Questions Dipl. et Colon.* 7 (1899): 201–209. **Ebray.**
L'émigration italienne et la Colonisation. Par M. Alcide Ebray.

Italy—Lakes. **Agostini.**
Terzo Congresso Geografico Italiano. Sullo stato attuale degli studi batometrici dei laghi italiani coll' aggiunta di un saggio per una bibliografia limnologica italiana. Communicazione del Dott. Giovanni De Agostini. Firenze, 1899. Size 9½ × 7, pp. 12. *Presented by the Author.*

Italy—Lecce. **Cocoto.**
Trade of the Province of Lecce for the year 1898. Foreign Office, Annual No. 2311, 1899. Size 10 × 6½, pp. 48. *Price* 2½*d.*

Includes a report on Brindisi.

Italy—Leghorn. **Carmichael.**
Trade of Leghorn for the year 1898. Foreign Office, Annual No. 2241, 1899. Size 10 × 6, pp. 22. *Price* 1½*d.*

Italy—Sicily. *Riv. G. Italiana* 6 (1899): 410–419. **Oliveri.**
Sulla identificazione dei fiumi che scorrono presso Girgenti coi nomi antichi di Akragas e Hypsas. Nota del Dott. Gaspare Oliveri. *With Map.*

Italy—Sicily. *Terrestrial Magnetism* 4 (1899): 87–92. **Palazzo.**
Carte Magnétique de la Sicile. Par M. L. Palazzo. *With Map.*

Italy—Sicily. **Ricchieri.**
Terzo Congresso Geografico Italiano. Saggi di correzione dei nomi locali nelle carte topografiche dell' Istituto Geografico Militare, per quanto riguarda la Sicilia Occidentale e Meridionale. Memoria del Prof. Giuseppe Ricchieri. Firenze, 1899. Size 9½ × 7, pp. 14. *Presented by the Author.*

On the necessity for revising the local names which appear on the official maps of Sicily.

Italy—Terrestrial Magnetism. *Atti R.A. Lincei Rendiconti* 8 (1899): 22–28. **Palazzo.**
Misure magnetiche eseguite in Italia nel 1891, e contribuzioni allo studio delle anomalie nei terreni vulcanici. Nota di Luigi Palazzo.

Italy—Venetia. **Thorndike-Nourse.**

Les valli de la Vénétie. Par Thorndike-Nourse.—Congrès International de Pêches Maritimes, Comptes rendus des Séances. Paris, 1899, pp. 395–423. *Illustrations.*

The *valli* of Venice are portions of shallow sea surrounded wholly or in part by dykes and utilized mainly for fishing, while the fertile land on their borders is cultivated.

Mediterranean Basin. *J. of T. Victoria I.* 31 (1899): 111–122. **Hull.**

The Physical Conditions of the Mediterranean Basin. By Prof. E. Hull, F.R.S. *With Map.*

Mediterranean—Crete. *Questions Dipl. et Colon.* 7 (1899): 146–151. **Moguez.**

La Crète Autonome. Par E.-H. Moguez. *With Map.*

Mediterranean—Cyprus.

Cyprus. Annual Reports for 1897–8. London: Eyre & Spottiswoode, 1899. Size 10 × 6½, pp. 108. *Price* 5½*d.*

Mediterranean—Cyprus. **Gennadius.**

Report on Agriculture in Cyprus. By P. Gennadius. London: Eyre & Spottiswoode, 1899. Size 10 × 6, pp. 34. *Price* 2½*d.*

A discussion of the various agricultural products of Cyprus and their derivatives (essential oils, etc.) likely to be of commercial value for export.

Mediterranean—Rhodes. **Bukowski.**

Geologische Uebersichtskarte der Insel Rhodus. Aufgenommen und erläutert von Gejza von Bukowski (Separat-Abdruck aus dem Jahrbuch der k.k. geolog. Reichsanstalt, 1898, Bd. 48, Heft 3 und 4.) Wien, 1899. Size 10½ × 7½, pp. [172]. *Map. Presented by the Author.*

A complete study of the geology of Rhodes, with a geological map, on the scale of 1:120,000, the topographical basis of which is the British Admiralty chart of the island.

North Sea Pilot. ———

Supplement 1899, relating to the North Sea Pilot, part ii. Fifth edition, 1895. London: J. D. Potter, 1899. Size 10 × 6½, pp. 47. *Presented by the Hydrographer, Admiralty.*

Norway. **Dundas.**

Trade of Norway for the year 1898. Foreign Office, Annual No. 2299, 1899. Size 9½ × 6½, pp. 64. *Price* 3*d.*

This report shows a remarkable increase in the utilization of the natural resources of Norway, especially in the export of ice, the development of mining and manufactures, and the utilization of electric power.

Rumania. *B.S.G. Română* 20 (1899): 1–118. **Brătianu.**

Trebuinta de a se face cadastrul Romănieĭ. De Generalu C. I. Brătianu.

Urging the importance of a cadastral survey of Rumania in order to facilitate the registration and transfer of property.

Rumania. **Liddell.**

Trade of Roumania for the year 1898. Foreign Office, Annual No. 2305, 1899. Size 10 × 6, pp. 24. *Price* 1½*d.*

The growing prosperity of Rumania has led to the institution of a direct express train service from Berlin to Bukharest in thirty-three hours, connecting twice weekly at Kustenji with new steamers to Constantinople, which can thus be reached in forty-eight hours instead of the sixty-four hours required by the Orient express.

Russia—Finland. **Perrott.**

Finland. An English journal devoted to the cause of the Finnish People. Edited by C. Harold Perrott, B.A. No. 1, June 3, 1899. London. Size 15 × 10½, pp. 20. *Price* 3*d. Presented by the Publishers.*

The first number of a periodical intended to spread a knowledge of Finland in this country.

Russia—Novaya Zemlya. **Tschernyschew and Jakowlew.**

Verh. Russ.-K. Mineralog. Ges. St. Petersburg. 36 (1899): 55–99.

Die Kalksteinfauna des Cap Grebeni auf der Waigatsch-Insel und des Flusses Nechwatowa auf Nowaja-Semlja. Von Th. Tschernyschew und N. Jakowlew. *With Plates.*

ASIA.

Ceylon. ——

Correspondence relating to Recent Land Legislation in Ceylon, June, 1899. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. vi. and 164. *Price* 1*s.* 4½*d.*

Ceylon. *J. Linnean S. (Botany)* 34 (1899): 300–365. **Pearson.**

The Botany of the Ceylon Patanas. By H. H. W. Pearson, B.A. *With Map.*

China. ——

Treaty Series. No. 11. 1899. Exchange of Notes between the United Kingdom and Russia with regard to their respective Railway Interests in China. London: Eyre & Spottiswoode, 1899. Size 10 × 6½, pp. 6. *Price* ½*d.*

China. ——

China: Imperial Maritime Customs. II. Special Series: No. 2. Medical Reports for the Half-year ended September 30, 1898. Shanghai; London: P. S. King & Son, 1899. Size 11 × 9, pp. vi. and 28. *Illustration.*

The medical reports include an abstract of meteorological observations.

China. *A travers le Monde, Tour du Monde* 5 (1899): 197–198. ——

La Baie de San-Moun. *With Map.*

China. *B.S. d'Études Colon.* 6 (1899): 3–48. **Bray.**

Entreprises en Chine. Par Fd. de Bray. *With Maps.*

On the opportunity for Belgian commercial enterprise in China, with sketch-maps of the projected railways.

China. *Imp. and Asiatic Quarterly Rev.* 7 (1899): 92-113. **Bullock.**

Intercourse in the Past between China and Foreign Countries. By T. L. Bullock.

China. *Verh. Ges. Erdk. Berlin* 26 (1899): 251-261. **Cholnoky.**

Herr Eugen von Cholnoky: Kurze Zusammenfassung der wissenschaftlichen Ergebnisse meiner Reise in China und in der Mandschurei in den Jahren 1896–1898.

China. **Elliot.**

The Prospect in Chinese Trade and the present opportunity. By G. F. Scott Elliot, M.A., etc. From the *Proceedings of the Philosophical Society of Glasgow.* 1899. Size 9 × 5½, pp. 20. *Presented by the Author.*

A thoroughly practical paper, dealing with the question of the production of silk and tea in China, and the demand for cotton goods. A list of over ninety recent authorities is given.

China. *Riv. G. Italiana* 6 (1899): 105-118, 216-221, 291-297, 357-367. **Gribaudi.**

L'avvenire economico della Cina. Del Dott. Pietro Gribaudi.

China. *Riv. G. Italiana* 6 (1899): 321-344. **Nocentini.**

L'Italia e la Cina. Conferenza . . . dal Prof. Lodovico Nocentini.

China. **Ricchieri.**

Prof. G. Ricchieri. L'Italia in Cina. Roma, 1899. Size 10 × 6½, pp. 28. *Presented by the Author.*

Reprint of an article in the *Rivista d'Italia* for 1899.

China—Amoy. **Little.**

Trade of Amoy for the year 1898. Foreign Office, Annual No. 2281, 1899. Size 10 × 6, pp. 18. *Price* 1½*d.*

China—Canton. *J. China Br. R. Asiatic S.* 30 (1899): 1-73. **Huart.**

Le Voyage de l'Ambassade Hollandaise de 1656 à travers la Province de Canton. Par C. Imbault Huart.

China—Chifu. **Hopkins.**

Trade of Chefoo for the year 1898. Foreign Office, Annual No. 2307, 1899. Size 10 × 6½, pp. 20. *Plan. Price* 3*d.*

This report contains a short account of Kiauchau bay, with a map, and also a notice of Wei-hai-wei.

China—Chungking. **Litton.**

Trade of Chungking for the year 1898. Foreign Office, Annual No. 2249, 1899. Size 10 × 6, pp. 18. *Price* 1½*d.*

China—Fuchau. **Fraser.**

Trade of Foochow for the year 1898. Foreign Office, Annual No. 2243, 1899. Size 9½ × 6½, pp. 16. *Price* 1*d.*

China—Ichang. **Holland.**
Trade of Ichang for the year 1898. Foreign Office, Annual No. 2280, 1899. Size 10 × 6½, pp. 10. *Price* 1*d*.

China—Kiukiang. **Brady.**
Trade of Kiukiang for the year 1898. Foreign Office, Annual No. 2308, 1899. Size 9½ × 6½, pp. 12. *Price* 1*d*.
Deals with the river trade on the Yangtze.

China—Lighthouses. ——
China: Imperial Maritime Customs. III. Miscellaneous Series, No. 6. List of the Chinese Lighthouses, Light-vessels, Buoys, and Beacons for 1899. (Corrected to December 1, 1898.) Shanghai; London: P. S. King & Son, 1899. Size 11 × 9, pp. 54. *Maps.*

China—Pakhoi. **Hurst.**
Trade of Pakhoi for the year 1898. Foreign Office, Annual No. 2228, 1899. Size 10 × 6½, pp. 10. *Price* 1*d*.

China—Railways. ——
China. No. 2 (1899). Correspondence between Her Majesty's Government and the Russian Government with regard to their respective Railway Interests in China. London: Eyre & Spottiswoode, 1899. Size 13 × 8½, pp. viii. and 92. *Price* 9½*d*.

China—Railways. *Questions Dipl. et Colon.* 7 (1899): 265–274, 321–332. **Marcillac.**
Les Chemins de fer en Chine. Par M. Jean de Marcillac. *With Map.*

China—Samshui. **Fox.**
Trade of Samshui for the year 1898. Foreign Office, Annual No. 2242, 1899. Size 9½ × 6, pp. 14. *Price* 1*d*.

China Sea. ——
The China Sea Directory. Vol. ii. Containing Directions for the Navigation of the China Sea, between Singapore and Hong Kong. (4th edition.) London: J. D. Potter, 1899. Size 9½ × 6½, pp. xxiv. and 564. *Index Chart. Price* 4*s*. *Presented by the Hydrographer, Admiralty.*

China—Shantung. *Petermanns M.* 45 (1899): 49–56, 82–91, 106–113. **Gaedertz.**
Eine Rekognoszierungsreise in der Provinz Schan-Tung. Von Oberingenieur A. Gaedertz. *With Map.*

China—Shashih. **Clennell.**
Trade of Shashih for the year 1898. Foreign Office. Annual No. 2258, 1899. Size 10 × 6½, pp. 12. *Price* 1*d*.

China—Swatow. **Ford.**
Trade of Swatow for the year 1898. Foreign Office, Annual No. 2238, 1899. Size 9½ × 6, pp. 16. *Price* 1*d*.

China—Trade. ——
China: Imperial Maritime Customs. I. Statistical Series, Nos. 3 and 4. Returns of Trade and Trade Reports for the year 1898. Part I.—Report on the Trade of China, and Abstract of Statistics. Shanghai; London: P. S. King & Son, 1899. Size 11 × 9, pp. 34.

China—Wuchau. **Hosie.**
Trade of Wuchow for the year 1898. Foreign Office, Annual No. 2248, 1899. Size 10 × 6, pp. 22. *Map. Price* 6*d*.
This report is accompanied by a map of the province of Kwangsi, showing the relative rank of the towns and the chief commercial products of the various regions.

China—Yunnan. *Questions Dipl. et Colon.* 7 (1899): 210–226. **Madrolle.**
A propos du Chemin de fer français au Yunnan. Iûn-Nân-Sèn, du 16 au 23 Octobre 1895. Par M. C. Madrolle. *With Map and Plans.*

Chinese Empire. **Wellby and Malcolm.**
Road Report of Route across Tibet and China. By Captain M. S. Wellby and Lieut. N. Malcolm. Simla, 1897. Size 13½ × 8½, pp. 42. *Maps.*
A note on this Report appeared in the *Journal* for March, 1898, vol. xi. p. 295.

Chinese Empire—Tibet. *B.S.G. Paris* 20 (1899): 198-213. **Bonin and Grenard.**
Les derniers Voyages dans le Tibet Oriental (MM. Holderer et Fütterer, M. et Mme. Rijnhart, M. Ch. Bonin). Par MM. C. E. Bonin et F. Grenard.

Egypt—Mount Sinai. *J. of T. Victoria I.* 31 (1899): 39–55. **Hull.**
Where is Mount Sinai? By Prof. Edward Hull, LL.D., etc. *With Map and Illustrations.*

India. *Imp. and Asiatic Quarterly Rev.* 7 (1899): 1–41. **Elliott.**
The recent Famine in India and the Reports of the Second Famine Commission. By Sir Charles Elliott, K.C.S.I., LL.D. *With Map.*

The map distinguishes those areas in which the famine was respectively intense, severe, and slight.

India. **Stein.**
Detailed Report of an Archæological Tour with the Buner Field Force. By M. A. Stein, PH.D. Lahore, 1898. Size 10 × 7, pp. 70. *Plans and Sections. Presented by the Punjab Government.*

India—Assam. **Kershaw.**
Report on the Trade between Assam and the Adjoining Foreign Countries for the Three Years ending the 31st March, 1899. By L. J. Kershaw. Shillong, 1899. Size 13 × 8½, pp. 28. *Map.*

India—Assam. *Mem. Geolog. Surv. India* 28 (1898): 71–95. **Smith.**
The Geology of the Mikir Hills in Assam. By F. H. Smith, A.R.C.S. *With Map.*

India—Bombay. *Mem. Geolog. Surv. India* 28 (1898): 27–30. **Oldham.**
A note on the Allah-bund in the north-west of the Rann of Kuchh. By R. D. Oldham, A.R.S.M., F.G.S. *With Map.*

India—Burma. *Mem. Geolog. Surv. India* 28 (1898): 30–71. **Grimes.**
Geology of parts of the Myingyan, Magwe, and Pakokku Districts, Burma. By G. E. Grimes. *With Maps.*

India—Geological Survey. **Griesbach.**
General Report on the Work carried on by the Geological Survey of India for the period from the 1st April, 1898, to the 31st March, 1899, under the direction of C. L. Griesbach. Calcutta, 1899. Size 10½ × 7, pp. 92. *Presented by the Geological Survey of India.*

AFRICA.

Bouvet Island. *Ann. Hydrographie* 27 (1899): 276–281. **Sachse.**
Die Wiederauffindung der Bouvet-Insel durch die deutsche Tiefsee-Expedition an Bord der "Valdivia." Bericht. . . . Von W. Sachse. *With Map and Plate.*

This is an account by the navigating officer of the *Valdivia* of the re-discovery of Bouvet island in the South Atlantic.

British East Africa—Pemba. **Baumann.**
Die Insel Pemba und ihre kleinen Nachbarinseln. Von Dr. Oscar Baumann.—Wissenschaftliche Veröffentlichungen des Vereins für Erdkunde zu Leipzig. Dritter Band, Drittes Heft. Leipzig: Duncker & Humblot, 1899. Size 10 × 6¾, pp. 16. *Map. Presented by the Verein für Erdkunde, Leipzig.*

British South Africa. ———
British South Africa Company. Correspondence with Mr. C. J. Rhodes relating to the Proposed Extension of the Bechuanaland Railway. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. 22. *Price* 2½*d.*

Correspondence relating to the "Cape to Cairo" railway.

British South Africa. **Schlichter.**
Travels and Researches in Rhodesia. By Henry Schlichter, D.SC. From the *Geographical Journal* for April, 1899. Size 10 × 6½, pp. 22. *Map and Illustrations.*

British West Africa. **Snelson.**
Modern Bundooism and Kindred Institutions in Pagan Africa. By Rev. F. G. Snelson, M.A., etc. Second Edition. Liverpool, 1899. Size 9 × 6, pp. 16. *Presented by the Author.*

On some of the customs of the pagan natives in West Africa.

Canary Islands. **Croker.**
Trade of Canary Islands for the year 1898. Foreign Office, Annual No. 2278, 1899. Size 10 × 6½, pp. 14. *Price* 1*d.*

Central Africa—Sport. **Foà.**

After Big Game in Central Africa. Records of a Sportsman from August, 1894, to November, 1897, when crossing the Dark Continent from the Mouth of the Zambesi to the French Congo. By Edouard Foà. Translated from the French, with an Introduction by Frederic Lees. London: A. & C. Black, 1899. Size 9 × 6½, pp. xxviii. and 330. *Map and Illustrations.* *Price* 21s. *Presented by the Publishers.*

M. Foa killed 500 head of big game on his journey from the mouth of the Zambezi to the mouth of the Congo, and the book contains a large number of illustrations of the animals killed. An appendix gives a summary of the game laws of some of the African territories.

Congo State. **Lancaster.**

Court Aperçu du Climat du Congo. Par A. Lancaster. Bruxelles, 1899. Size 7½ × 5, pp. 44. *Sketch-map.* *Presented by the Author.*

Congo State. **Raikes.**

Summary of Congo Trade Returns for the year 1898. Foreign Office, Annual No. 2292, 1899. Size 10 × 6, pp. 10. *Price* 1d.

Egypt. *Cosmos* 12 (1894–96): 270–309, 321–355. **Revelli.**

Il Viaggio in Oriente di Vitaliano Donati (1759–1762). Ricerche e studi del Dottor Paolo Revelli.

The second part describes the journey of Donati in Egypt in detail, the earlier instalment referring mainly to biographical particulars and the journey in Eastern Europe.

Egypt. *J. of T. Victoria I.* 31 (1899): 57–71. **Walker and Dawson.**

Herodotus. I.—How far his Remarks bearing on Egyptian Geology are reliable in the Light of recent Egyptian Research. By Rev. F. A. Walker, D.D.; Sir J. W. Dawson, C.M.G., F.R.S., on the same.

Egyptian Sudan. *Cosmos* 12 (1894–96): 259–270, 363–366. ———

R. Slatin Pascià nel Sudân Orientale, 1879–1895.

Egyptian Sudan. *B.S. Khédiv. G.* 5 (1899): 167–183. **Abbate.**

Khartoum-Omdourman et la chute du Mahdisme. Par le Dr. Abbate Pacha.

Egyptian Sudan. **Lamb.**

Trade of Suakin for the year 1898. Foreign Office, Annual No. 2247, 1899. Size 10 × 6, pp. 14. *Price* 1d.

Interesting particulars are given showing the gradual return of prosperity to Suakin as the port of the Sudan.

Egyptian Sudan. *P.R. Artillery I.* 26 (1899): 267–284. **Parsons.**

The Eastern Soudan. By Colonel C. S. Parsons, R.A. *With Maps.*

An account of the fighting on the Atbara and the capture of Gedarif, with a description of the portion of the Sudan between the Red Sea and the Nile.

Egyptian Sudan. **Reed.**

Fashoda and the Bahr-el-Ghazal. By J. Howard Reed. Manchester: T. Sowler & Sons, 1899. Size 8½ × 5½, pp. 60. *Illustrations.* *Price* 6d. *Presented by the Author.*

A short historical account of the Egyptian Sudan.

French Congo. *C.Rd. S.G. Paris* (1899): 221–222. **Béhagle.**

Haut-Oubangui. Mission de Béhagle. *With Map.*

French West Africa. *B.S.G. Paris* 20 (1899): 220–235. **Chanoine.**

Mission Voulet-Chanoine. Itinéraire du capitaine Chanoine de Dienné à Sansanné-Haoussa.

French West Africa. *B.S.G. Lille* 31 (1899): 357–368. **Chanoine.**

Mission Voulet-Chanoine. Par Capitaine Chanoine.

French West Africa. *C. Rd. S.G. Paris* (1899): 211–214. **Clozel.**

La Côte d'Ivoire. Par M. François J. Clozel.

French West Africa. *Questions Dipl. et Colon.* 7 (1899): 103–108. **Machat.**

Les Ressources économiques du Fouta-Djallon. Par J. Machat.

German East Africa. *M. Deutsch. Schutzgeb.* 12 (1899): 51–62. ———

Weitere Resultate der meteorologischen Beobachtungen im Kondeland.

German East Africa. *M. Deutsch. Schutzgeb.* 12 (1899): 105–106. **Herrmann.**
Hauptmann Herrmanns Aufnahmen zwischen dem Victoria-Nyansa und dem Kagera. Von Dr. R. Kiepert. *With Map.*

German East Africa. *M. Deutsch. Schutzgeb.* 12 (1899): 63–64. **Maurer.**
Astronomische Ortsbestimmungen, magnetische Deklinationsbestimmungen und Höhenmassungen im Kilimandjaro-Gebiet. Angestellt von Dr. Maurer.

German East Africa. *M. Deutsch. Schutzgeb.* 12 (1899): 44–48. **Ramsay.**
Resultate aus den geographischen Ortsbestimmungen des Hauptmanns Ramsay auf der Reise nach Udjidji und an diesem Orte selbst. Januar bis Juni 1897. Bearbeitet von L. Ambronn.

German East Africa. *M. Deutsch. Schutzgeb.* 12 (1899): 48–50. **Ramsay.**
Bestimmungen der geographischen Breite einer Reihe von Orten, ausgeführt von Hauptmann Ramsay auf der Tongwe-Expedition und auf einem späteren Marsche in der Zeit vom 23 August bis 13 Dez 1897. Bearbeitet von L. Ambronn und E. Grossmann.

German East Africa. *M. Deutsch. Schutzgeb.* 12 (1899): 67–105. **Richter.**
Der Bezirk Bukoba. Von Oberleutnant Richter. *With Map.*

German South-west Africa. *M. Deutsch. Schutzgeb.* 12 (1899): 41–43. **Estorff.**
Astronomische Ortsbestimmungen in Südwestafrika. Ausgeführt von Hauptmann v. Estorff. Berechnet von Astronom M. Schnauder.

German West Africa—Kamerun. *M. Deutsch. Schutzgeb.* 12 (1899): 38–40. **Moisel.**
Begleitworte zu der Karte des nördlichen Bulugebietes. Von Max Moisel. *With Map.*

German West Africa—Kamerun. *M. Deutsch. Schutzgeb.* 12 (1899): 65. ———
Regenmessungen in Debundja.

German West Africa—Kamerun. *M. Deutsch. Schutzgeb.* 12 (1899): 66. **Besser.**
Astronomische Ortsbestimmungen in Kamerun. Ausgeführt von Hauptmann v. Besser. Berechnet von M. Schnauder.

German West Africa—Togo. *M. Deutsch. Schutzgeb.* 12 (1899): 1–37. ———
Ueber das Harmattanphänomen in Togo. 1. Beobachtungen über den Harmattan von Dr. H. Gruner; 2. Bemerkungen zu den meteorologischen Beobachtungen in Bismarckburg von A. Mischlich; 3. Bemerkungen zu den meteorologischen Beobachtungen in Sugu-Wangara im Marz 1897, von Leutnant v. Seefried; 4. Schlussbemerkung von Dr. von Danckelmau.

German West Africa—Togo. *Questions Dipl. et Colon.* 7 (1899): 286–292. **Hauser.**
Études sur les Colonies Allemandes. I.—Togo. Par H. Hauser.

Marocco. **White.**
Trade of Tangier and District for the year 1898. Foreign Office, Annual No. 2296, 1899. Size 9½ × 6, pp. 22. *Price* 1½*d.*

Nigeria. ———
Niger. West African Frontier Force. Reports for 1897-98. Colonial Reports, Annual No. 260, 1899. Size 10 × 6, pp. 36. *Price* 2½*d.*

These reports contain some interesting information as to the character of the natives recruited for the West African Frontier Force.

Nigeria. **Edwards.**
The Future of the Niger. By Fredk. A. Edwards. From the *Westminster Review*, April, 1899, pp. 388–397. Size 10 × 6½. *Presented by the Author.*

This paper deals with the progress which has been made by the Royal Niger Company and the colonial officers in opening up the country and repressing the savagery of the natives.

NORTH AMERICA.

Canada—New Brunswick. *B. Nat. Hist. S. New Brunswick* 4 (1899): 122–136. **Ganong.**
Notes on the Natural History and Physiography of New Brunswick. By W. F. Ganong, PH.D.

One of these notes points out the disadvantages which the want of a topographical survey entails on the province of New Brunswick: another deals with the mud of the frequent mud lakes. This mud far exceeds the water in depth, is composed of

microscopic siliceous plants, mainly desmids and diatoms, and is rapidly filling the lakes with deposits of siliceous earth.

Canada—New Brunswick. **Matthew and Kain.**
On Artesian and Fissure Wells in New Brunswick. By G. F. Matthew and S. W. Kain. Reprinted from *Bulletin* of the Natural History Society of New Brunswick, No. xvii., 1899. Size 9 × 6, pp. 143–152. *Presented by S. W. Kain, Esq.*

Canada—N.W.T. *Scottish G. Mag.* 15 (1899): 351–356. **Begg.**
Early Exploration in North-West Canada. By Alexander Begg.

Canada—Nova Scotia. *P. Boston S. Nat. History* 28 (1899): 375–407. **Woodman.**
Studies in the Gold-Bearing Slates of Nova Scotia. By J. Edmund Woodman. *With Map and Plates.*

Canada—Rocky Mountains. **Collie.**
Exploration in the Canadian Rockies: A search for Mount Hooker and Mount Brown. By Prof. Norman Collie, F.R.S. From the *Geographical Journal* for April, 1899. Size 10 × 6½, pp. 22. *Map and Illustrations.*

Canada—Tides. **Dawson.**
Survey of Tides and Currents in Canadian Waters. Report of Progress. By W. Bell Dawson, C.E. Ottawa, 1899. Size 10 × 6½, pp. 36. *Map and Diagrams.*

Newfoundland—Cod fishery. **Bellet.**
La pêche de la morue sur le grand banc de Terre-Neuve. Par M. A. Bellet. Congrès International de Pêches Maritimes, Comptes rendus des séances. Paris, 1899. Pp. 120–142.

Newfoundland—Historical. **Musset.**
Les Rochelais à Terre-Neuve, d'après un mémoire de M. Musset.—Congrès International de Pêches Maritimes, Comptes rendus des Séances. Paris, 1899. Pp. 150-153.

It is stated that between 1497 and 1550, out of 128 recorded voyages from Europe to the Grand Banks of Newfoundland no less than 93 were by French vessels, most of them sailing from La Rochelle.

Southern California. *J. School G.* 3 (1899): 201–212. **Chamberlain.**
Southern California. By J. F. Chamberlain. *With Illustrations.*

United States. ———
Annual Reports of the War Department for the Fiscal Year ended June 30, 1898. Report of the Chief of Engineers. 6 vols. Washington, 1898. Size 9½ × 6, pp. 3856. *Charts, Diagrams, and Illustrations. Presented by the Chief of Engineers, U.S. Army.*

United States. *Rev. G.* 44 (1899): 401–414. **Barré.**
Les États-Unis d'Amérique et leur extension en 1899. Conséquences de la guerre hispano-américaine. Par P. Barré.

United States. *Terrestrial Magnetism* 4 (1899): 93–104. **Bauer.**
The Magnetic Work of the United States Coast and Geodetic Survey. By L. A. Bauer.

United States. *J. Geology* 7 (1899): 375–388. **Hobbs.**
The Diamond Field of the Great Lakes. By W. H. Hobbs.

United States. **Porter.**
Impressions of America. By T. C. Porter. London: C. A. Pearson, 1899. Size 9 × 6, pp. xxiv. and 242. *Illustrations. Presented by the Publishers.*

An unusually interesting account of a pleasure trip to Niagara, the Yellowstone Park, California, and Colorado. The book is illustrated in an original manner by a fine series of photographic reproductions arranged in pairs for stereoscopic vision, a small stereoscope being provided for that purpose and placed in a pocket at the end of the book.

United States—Anthropology. **Hrdlicka.**
Anthropological Investigations on One Thousand White and Colored Children of Both Sexes, The Inmates of the New York Juvenile Asylum, etc. By Dr. Ales Hrdlicka. Size 9½ × 6, pp. 86. *Illustrations. Presented by the Directors of the New York Juvenile Asylum.*

CENTRAL AND SOUTH AMERICA.

Brazil. **Siemiradzki.**
La Nouvelle Pologne, état de Paraná (Brésil). Par B. Joseph de Siemiradzki. (Université Nouvelle, Institut Géographique de Bruxelles, Publication No. 1.) Bruxelles, 1899. Size 10 × 6½, pp. 12. *Map. Presented by the Institut Géographique de Bruxelles.*

Brazil—Bahia. *Rev. Trim. I.G. e Hist. Bahia* **6** (1899): 69–73. **Vasconcellos.**
Descripção da Bahia de Todos os Santos. Por Simão de Vasconcellos.

Brazil—Bahia. *Rev. Trim. I.G. e Hist. Bahia* **6** (1899): 13–25. **Lima.**
O Dique da Bahia. Pelo Dr. J. F. da Silva Lima.

Brazil—Bahia. **Nicolini.**
Trade of Bahia for the years 1896–97–98. Foreign Office, Annual No. 2282, 1899. Size 10 × 6½, pp. 20. *Price* 1½*d.*

Brazil—Bahia. *Rev. Trim. I.G. e Hist. Bahia* **6** (1899): 75–80. **Pereira.**
Noticia sobre a descoberta das Lavras Diamantinas na Bahia pelo coronel Gonçalo Pereira.

Brazil—Bahia. *Rev. Trim. I.G. e Hist. Bahia* **6** (1899): 57–68. **Praguer.**
Riquoza mineral do Estado da Bahia. VIII. O Diamante. Por Henrique Praguer.

Brazil—Geology. *B. Museu Paraense* **2** (1897): 155–204; (1898): 322–382. ———
Trabalhos restantes ineditos da Commissão Geologica do Brazil (1875–1878), relativos á geologia e geographia physica do Baixo-Amazonas.

Brazil—Parana. *L'Esplorazione Com.* **14** (1899): 33–50, 92–106, 129–142. **Tonissi.**
L. Tonissi. Progetto per un' impresa di Colonizzazione nello Stato del Paranà.

Brazil—Pernambuco. **Howard.**
Trade of Pernambuco and District for the year 1898. Foreign Office, Annual No. 2288, 1899. Size 9½ × 6, pp. 26. *Price* 2*d.*

Contains tables of monthly rainfall at Pernambuco for the ten years 1889–1898. Most rain falls in May and June, least between October and January, but the totals are subject to remarkable variations. The total annual rainfall of 1895 was 116 inches, that of 1898 only 52 inches.

Brazil—Plants. *B. Museu Paraense* **2** (1898): 288–321. **Huber.**
Materiaes para a flora amazonica. Pelo Dr. J. Huber. *With Plates.*

Brazil—Rio. *B. Museu Paraense* **2** (1898): 382–385. **Huber.**
O "Muricy" da Serra dos Orgãos. Pelo Dr. J. Huber.

Brazil—Rio de Janeiro. **Rhind.**
Trade of Rio de Janeiro for the year 1898. Foreign Office, Annual No. 2284, 1899. Size 10 × 6½, pp. 44. *Price* 2½*d.*

Brazil—Santarem. *B. Museu Paraense* **2** (1897): 78–96. **Katzer.**
A boz do Tapajós e suas relações com a agua subterranea na região de Santarem. Pelo Dr. Friederich Katzer. *With Map, Plan, &c.*

Chile. *Verh. Ges. Erdk. Berlin* **26** (1899): 265–270. **Krüger.**
Herr Dr. Paul Krüger über die Erforschung des Rio Yelcho oder Futaloufu in West-Patagonien.

Chile—Valparaiso. **Cusack-Smith.**
Trade of Valparaiso and District for the year 1898. Foreign Office, Annual No. 2287, 1899. Size 10 × 6½, pp. 30. *Price* 2*d.*

Consular reports usually complain that British firms will not issue price lists and circulars in native languages; this report mentions, as a hopeful exception, that a Doncaster firm is circulating its lists throughout Chile in Spanish.

Curaçoa. **Jesurun**
Trade of Curaçoa and Dependencies for the year 1898. Foreign Office, Annual No. 2244, 1899. Size 10 × 6, pp. 28. *Price* 2*d.*

Ecuador—Guayaquil. **Chambers.**
Trade of Guayaquil for the year 1898. Foreign Office, Annual No. 2246, 1899. Size 10 × 6, pp. 12. *Price* 1*d.*

Nicaragua. *National G. Mag.* 10 (1899): 247–266. **Davis.**
Nicaragua and the Isthmian Routes. By A. P. Davis. *With Illustrations.*

Nicaragua. *National G. Mag.* **10** (1899): 233–246. **Hayes.**
Physiography of the Nicaragua Canal Route. By C. Willard Hayes. *With Maps and Illustrations.*

Nicaragua Canal. *B.S.G. Madrid* **41** (1899): 84–123. **Llopis.**
Estudios sobre el Canal de Nicaragua. Por D. Arturo Llopis. *With Map.*

Paraguay. **Croskey.**
Trade of Paraguay for the year 1898. Foreign Office, Annual No. 2275, 1899. Size 10 × 6½, pp. 12. *Price* 1*d.*

Paraguay. *B.S.G. Madrid* **41** (1899): 7–22. **Jove.**
La República del Paraguay. Por D. Manuel G. Jove.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia—Oceanography. *Rep. Australasian Assoc.* 7 (1898): 687–701. **Fowler.**
A Contribution to Australian Oceanography. By Thos. Walker Fowler.

Central Australia. *Rep. Australasian Assoc.* 7 (1898): 682–686. **Tietkens.**
Remarks on Central Australia, suggesting Further Exploration. By W. H. Tietkens.

German New Guinea. *M. Deutsch. Schutzgeb.* **12** (1899): 107–118. **Hahl.**
Der Bismarck-Archipel und die Salomons-Inseln. Von Assessor Dr. A. Hahl.

New Caledonia. **Erskine.**
Trade of New Caledonia for the year 1898. Foreign Office, Annual No. 2300, 1899. Size 10 × 6½, pp. 14. *Price* 1*d.*

New Guinea. *P.R.S. Queensland* **14** (1899): 14–20. **Bailey.**
Notes on the Vegetation of New Guinea. By F. Manson Bailey.

From observations made during a visit with Lord Lamington, the Governor of Queensland.

New Guinea. *Rep. Australasian Assoc.* 7 (1898): 712–722. **McClymont.**
The Discovery of New Guinea by Antonio D'Abreu. By J. R. McClymont, M.A. *With Map.*

New South Wales. ———
New South Wales Statistical Register for 1897 and Previous Years. Sydney, 1898. Size 10 × 6½, pp. viii. and 902. *Map. Presented by the Agent-General for New South Wales.*

New South Wales. **Campbell.**
Memoirs of the Geological Survey of New South Wales. Ethnological Series. No. 1. Aboriginal Carvings of Port Jackson and Broken Bay: measured and described by W. D. Campbell, A.K.C., etc. Sydney, 1899. Size 12½ × 10, pp. 74. *Map and Plates. Presented by the Survey.*

New South Wales. *Rep. Australasian Assoc.* 7 (1898): 176–237. **Furber.**
The Trigonometrical Survey of New South Wales, with mention of Similar Surveys in the other Colonies. By T. F. Furber. *With Maps and Plans.*

Describes the primary triangulation of New South Wales, with maps and diagrams, and gives maps also showing the extent of triangulations in Australia, and the position of stations in New South Wales and Queensland the latitude and longitude of which have been accurately determined.

New South Wales. **Watt.**
New South Wales. Mineral Resources, No. 5. Report on the Wyalong Gold-Field. By J. A. Watt, M.A., etc. Sydney, 1899. Size 10 × 6½, pp. 40. *Map. Presented by the Geological Survey of New South Wales.*

New South Wales—Meteorology. **Russell.**
Results of Rain, River, and Evaporation Observations made in New South Wales during 1897. By H. C. Russell, B.A., etc. Sidney, 1898. Size 9½ × 6, pp. lxiv. and 220. *Map and Diagrams. Price* 3*s.* 6*d. Presented by the Author.*

New Zealand. ———
Statistics of the Colony of New Zealand for the Year 1897: with statistics of Local Governing Bodies for the year ended 31st March, 1898. Wellington, 1898. Size 13½ × 8½. pp. xvi. and 510.

New Zealand. *P.I. Civil Engineers* **136** (1899): 263–267. **Rawson.**

Westport Harbour, New Zealand—Wave Basin. By T. H. Rawson. *With Plan.*

This short paper describes and figures the method employed for protecting the chief coal-exporting harbour of New Zealand from the effects of a heavy sea entering a narrow river, which runs in at right angles to the coast, facing the prevailing wind.

Queensland. **Dunstan.**

Report on the Mesozoic Coal Measures of Stanwell and associated formations. By B. Dunstan. Brisbane, 1898. Size 13 × 8½, pp. 22. *Maps and Illustrations. Presented by the Queensland Government.*

Queensland—Brisbane River. *P.I. Civil Engineers* **136** (1899): 268–281. **Williams.**

Floods in the Brisbane River; and a System of Predicting their Heights and Times. By C. J. R. Williams. *With Map and Diagram.*

Includes a sketch-map of the basin of the Brisbane river, showing the position of the various flood-gauges.

Samoa. *National G. Mag.* **10** (1899): 218–220. **Austin.**

The Commercial Importance of Samoa. By O. P. Austin.

Samoa. *Ann. G.* **8** (1899): 369–373. **Bellet.**

La valeur économique de Samoa. Par M. D. Bellet.

Samoa. *Globus* **76** (1899): 4–13. **Reinecke.**

Zur Kennzeichnung der Verhältnisse auf den Samoa-Inseln. Von Dr. Reinecke. *With Illustrations.*

Samoa. *National G. Mag.* **10** (1899): 207–217. **Webster.**

Samoa: Navigators Islands. By Commander H. Webster. *With Illustrations.*

POLAR REGIONS.

Arctic—Bear Island. *Ymer* **19** (1899): 171–185. **Nathorst.**

Några upplysningar till den nya Kartan öfver Beeren Eiland. Af A. G. Nathorst. *With Maps and Illustrations.*

A new map of Bear island, with notes upon it.

MATHEMATICAL GEOGRAPHY.

Height Measurement. **Mohn.**

Videnskabsselsk. Skrifter, Christiania (1899. No. 2): 1–70.

Das Hypsometer als Luftdruckmesser und seine Anwendung zur Bestimmung der Schwerekorrektion. Von H. Mohn.

Latitude Determinations. **Cattolica.**

Stazione Astronomica a San Cataldo di Bari eseguita da Pasquale Leonardi Cattolica. Campagna Idrografica dello "Scilla." 1898. Genoa, 1899. Size 12½ × 9, pp. 50. *Plates. Presented by the Italian Hydrographic Office.*

On the determination of the absolute azimuth and the latitude of San Cataldo di Bari, with tables of observations and an illustrated description of instruments and methods.

Nautical Almanac. ———

The American Ephemeris and Nautical Almanac for the year 1901. First Edition. Washington, 1899. Size 11 × 7½, pp. 632. *Diagram.*

Time. **Hayden.**

Clock-Rates and Barometric Pressure as illustrated by the Mean-Time Clock and three Chronometers at Mare Island Observatory, with a brief account of the Observatory. By Ensign Everett Hayden. [Reprinted from *Publications of the Astronomical Society of the Pacific*, No. 68.] San Francisco, 1899. Size 9 × 6, pp. 101–114. *Diagrams. Presented by the Author.*

The astronomically regulated clock at Mare Island Observatory is the standard for rating chronometers at all the ports of the Pacific states, to which the beats of its pendulum are transmitted electrically for five minutes daily in an audible manner.

Time reckoning. *J. School G.* **3** (1899): 168–172. **Holmes.**

Where does the Day begin? By F. H. Holmes.

On the date-line in the Pacific ocean.

Units of Measurement. **Warren.**

Palestine Exploration Fund, Quarterly Statement (1899): 218-268.

The Ancient Standards of Measure in the East. By Lieut.-General Sir Charles Warren, K.C.B., F.R.S.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Geomorphology. **Gregory.**

The Plan of the Earth and its Causes. By J. W. Gregory, D.SC. From the *Geographical Journal* for March, 1899. Size 10 × 6½, pp. 225-251.

Geophysics. *J. of T. Victoria I.* **31** (1899): 11-37. **Kelvin.**

The Age of the Earth as an Abode fitted for Life. By the Right Hon. Lord Kelvin. [Annual Address.]

Geophysics. *Science* **9** (1899): 889-901: 10 (1899): 11-18. **Chamberlin.**

Lord Kelvin's Address on the Age of the Earth as an Abode fitted for Life. By Prof. T. C. Chamberlin

Criticism of Lord Kelvin's address.

Meteorology. **Berry.**

Proceedings of the Convention of Weather Bureau Officials, held at Omaha, Nebr., October 13-14, 1898. Edited by James Berry. Bulletin No. 24, U.S. Department of Agriculture. Weather Bureau, Washington, 1899. Size 9 × 6, pp. 184. *Plate.*

Meteorology. *Symons's Monthly Meteorolog. Mag.* **34** (1899): 81-86. ———

Meteorological Extremes—Pressure.

The highest authentic reading of atmospheric pressure reduced to sea-level was 31·780 inches at Irkutsk in 1893; the highest in Europe, 31·108 at Ochtertyre in 1896; the highest in America, 31·420 at Swift Current on the Canadian Pacific Railway. The lowest ever observed on land was 27·124 in Orissa in 1885, and the lowest in Europe 27·332 at Ochtertyre. A reading of 27·04 was recorded at sea in the heart of a West Indian hurricane.

Meteorology—Clouds. **Henry.**

U.S. Dep. Agriculture, Monthly Weather Rev. **27** (1899); 57-58.

Wave or billow clouds. By A. J. Henry. *Plates.*

Meteorology—Hygrometry. **Lancaster.**

De la manière d'utiliser les observations hygrométriques. Par A. Lancaster. Rapport lu au Ve Congrès international d'Hydrologie, de Climatologie et de Géologie médicales de Liége, 1898. Liége, 1899. Size 9½ × 6½, pp. 14. *Presented by the Author.*

Meteorology—Instruments. ———

The Baro-cyclono-meter. Manila, 1898. Size 9½ × 7, pp. 8. *Illustration and Diagrams. Presented by the Manila Observatory.*

This instrument is devised in order to predict cyclones in Eastern seas with greater certainty than has hitherto been possible for an isolated observer.

Meteorology—Rainfall. **Black.**

Ocean Rainfall by Rain-Gauge Observations at Sea. General, and Special Oceans. By W. G. Black. 1864-75-81. Edinburgh: E. & S. Livingstone. Size 9½ × 6¼, pp. 16. *Diagrams. Presented by the Author.*

Ocean Currents. **Russell.**

Current Papers, No. 3. By H. C. Russell, B.A., etc. [Read before the Royal Society of N.S. Wales, October 5, 1898.] Reprinted from *Journal and Proceedings of the Royal Society of N.S. Wales*, vol. xxxii. Size 9 × 6, pp. 12. *Maps. Presented by the Author.*

Ocean Depths. ———

List of Oceanic Depths and Serial Temperature Observations received at the Admiralty during the year 1898, from H.M. Surveying Ships, Indian Marine Survey, and British Submarine Telegraph Companies. London: J. D. Potter, 1899. Size 13½ × 8½, pp. 26. *Price 4s.*

Ocean-floor. **Hull.**

On the Sub-Oceanic Physical Features off the Coast of Western Europe, including France, Spain, and Portugal. By Prof. Edward Hull, LL.D., F.R.S. From the *Geographical Journal* for March, 1899. Size 10 × 6¼, pp. 10. *Map.*

Oceanography. **Hector.**

Australasian Association for the Advancement of Science. Sydney Session, 1898. Section E—Geography. Presidential Address by Sir James Hector, K.C.M.G., etc. Size 8¾ × 5½, pp. 8. *Map. Presented by the Author.*

The address deals mainly with submarine geography.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Historical—Cabot. **Harrisse.**

The Cabots. Notes on certain Papers contributed to the Transactions of this Society. By Henry Harrisse. From the *Transactions of the Royal Society of Canada.* Second Series, 1898–99, vol. iv., section II. Ottawa: J. Hope & Sons, 1898. Size 10 × 7, pp. 103–106.

Historical—Hanno. **Illing.**

Der Periplus des Hanno. Von Dr. Karl Emil Illing. Dresden, 1899. Size 10 × 8½, pp. 50.

Historical—Magellan. **Alberto.**

Gaetano Alberto. Descobrimento das Filippinas pelo navegador Portuguez Fernão de Magalhães. Lisboa, 1898. Size 8 × 5½, pp. 148. *Illustrations. Presented by the Author.*

Historical—Marco Polo. **Nordenskjöld.**

The Influence of the 'Travels of Marco Polo' on Jacobo Gastaldi's Maps of Asia. By Baron A. E. Nordenskjöld. From the *Geographical Journal* for April, 1899. Size 10 × 6½, pp. 12.

Political Geography. *G. Tidskrift* **15** (1899): 22–29. **Elberling.**

Ændringer i den politiske Geografi i den sidste snes aar. Af Rigsdags-Bibliothekar Emil Elberling.

On recent changes in political geography.

Political Geography. *National G. Mag.* **10** (1899): 185–206. **McGee.**

National Growth and National Character. By W. J. McGee.

An address to the National Geographic Society on March 28, 1899, as a summary of a course of lectures on the territorial growth of the United States.

Tropical Colonisation. *Kolon. Jahrb.* **11** (1899): 213–240. **Meinecke.**

Siedelung in den Tropen. Eine Mahnung und Warnung. Von G. Meinecke.

GENERAL.

Bibliography. ———

Catalogue de la Bibliothèque de feu M. le Dr. P. J. Veth. Leide: E. J. Brill, 1899. Size 9¼ × 6¼, pp. iv. and 162. *Portrait. Presented by Messrs. Dulau & Co.*

Contains a portrait of the late Prof. Veth, a list of his writings, and the catalogue of his extensive library of Oriental and geographical works.

Bibliography. *Science* **9** (1899): 761–771, 799–808. **Adler.**

The International Catalogue of Scientific Literature.—Second Conference. By Cyrus Adler.

A full report by the American delegate of the second conference held by the Royal Society to consider an International Catalogue of Scientific Literature. It was decided at that conference to consider mathematical and physical geography alone in the proposed catalogue, ignoring the general science of geography.

Bibliography. **Boutwell.**

Bibliography of Geographical Works published in the United States in 1898. By J. M. Boutwell.—Bull. American Geographical Society, vol. xxxi., 1899, No. 2. Size 9¼ × 6, pp. 16. *Presented by the Compiler.*

Bibliography. *Science* **9** (1899): 825–835. **Carus.**

On the International Catalogue of Scientific Literature of the Royal Society. By Prof. J. Victor Carus.

A criticism of the conclusions of the second conference, based on Dr Adler's report.

Bibliography. **Knox.**
Geographical Index (Extra-European) to Books, Periodicals, etc. Compiled in the Intelligence Division, War Office, by Alexander Knox, B.A., Map Curator. 1898. London: Harrison & Sons. Size 11 × 7¼, pp. xvi. and 114. *Presented by the Intelligence Division, War Office.*

Bibliography. *Science* **9** (1899): 907–909. **Shaler.**
The International Catalogue of Scientific Literature. Geology and Geography, by Prof. N. S. Shaler.

Educational. **Brigham.**
Physical Geography in Secondary Schools. By Prof. A. P. Brigham. Reprinted from the *Proceedings of the National Educational Association*, 1897. Size 9 × 6, pp. 924–928. *Presented by the Author.*

Geographical Discovery. *Rep. Australasian Assoc.* **7** (1898): 672–682. **Macdonald.**
Sixty Years' Progress of Geographical Discovery (1837–1897). By A. C. Macdonald.

Geographical Exhibition. *J. School G.* **3** (1899): 216–222. **Dodge.**
The Geographical and Geological Exhibition at Springfield, Mass. By Richard E. Dodge.

Geographical Orthography. *J. School G.* **3** (1899): 161–167. **Chisholm.**
Notes on the Spelling of some Common Geographical Names; given in No. 9, vol. ii. of the *Journal*. By G. G. Chisholm.

Geographical Progress. *B.S.G. Lyon* **15** (1899): 609–645. **Groffier.**
Travaux géographiques des missionnaires catholiques en 1898. Par M. V. Groffier.

German Colonies. ———
Jahresbericht der Deutschen Kolonialgesellschaft, 1898. Berlin, 1899. Size 9½ × 6½, pp. 60.

German Colonies—Bibliography. *Kolon. Jahrb.* 11 (1899): 278–304. **Brose.**
Die deutsche Koloniallitteratur im Jahre 1897, zusammengestellt von Maximilian Brose.

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**

Publications issued since August 8, 1899.

1-inch—General Maps:—

England and Wales:—152, 168 (revision), engraved in outline; 108, 110, 199, 201, 204, 216, 218, 235, 309, 325, 326 (revision), hills engraved in black or brown. 1*s. each.*

6-inch—County Maps:—

England and Wales:—**Cheshire** (revision), 2 S.W., S.E., 3 N.W., 4 N.W., N.E., 5 N.W., 9 N.E., 10 N.E., S.W., 15 S.W., S.E., 11 S.W., 16 N.W., N.E., 17 S.W., S.E., 18 complete, 19 N.W., S.W., 20 S.W., 23 N.E., 24 N.W., 26 complete, 27 N.W., S.W., 28 S.W., 29 N.E., 34 N.E., S.W., S.E., 35 complete, 36 N.W., S.W., S.E., 37 N.E., S.W., 40 N.W., S.E., 41 N.W., N.E., S.E., 42 complete, 43 complete, 44 N.W., N.E., 48 S.E., 49 N.W., S.W., S.E., 50 complete, 51 N.W., N.E., S.W., 55 N.E., S.E., 56 N.W., S.W., S.E., 57 N.W., N.E., S.W., 60 N.E., 61 N.E., S.W., 62 complete, 65 N.E., 66 N.W., N.E. **Derbyshire**, 1 S.W., 2 N.E., S.W., 4 N.W., 5 N.W., S.W., S.E., 9 N.W., 11 S.W., S.E., 12 N.E., S.W., S.E., 14 N.E., 15 N.E., S.W., S.E., 16 complete, 17 N.E., S.W., S.E., 18 S.W., S.E., 19 N.W., N.E., S.E., 22 N.W., N.E., 23 complete, 24 complete, 25 S.W., S.E., 26 N.E. **Hertfordshire**, 5 S.E., 23 N.E., 26 S.W., 32 N.E., 40 N.W. **Nottinghamshire**, 12 N.E., S.E., 17 N.E. **Sussex**, 9 S.E. 1*s. each.*

25-inch—Parish Maps:—

England and Wales (revision):—**Berkshire**, I. 8, 12, 16; II., 6, 9, 13; V. 4, 8; VI. 1, 2, 5, 6, 7, 12, 13, 15, 16; IX. 1, 2, 5, 6, 9, 10, 11, 12, 13, 14, 15, 16; X. 2, 4; XV. 2, 3, 4, 5, 6, 8, 11, 12, 14, 16; XXI. 1, 2, 3, 4, 6, 8, 10, 12, 15, 16; XXIV. 14; XXVII. 2, 8; XXIX. 13, 14; XXXII. 9; XXXVI. 2, 3, 4, 10, 11; XXXVIII. 1,

5, 9, 14; XL. 14; XLV. 4; XLVI. 2; XLVII. 4, 7, 8, 10, 11; XLVIII. (1 and 5). **Bucks**, XXVI. 15; XXVIII. 10; XXIX. 9, 13, 14, 15; XXXI. 3, 4, 8; XXXII. 1, 2, 3; XXXIII. 1, 2, 3, 4, 8, 12, 16; XXXIV. 1, 2, 3, 5, 6, 9, 10, 11, 13, 14, 16; XXXV. 13; XXXVIII. 4; XXXIX. 1; LVI. 9. **Cheshire**, XIII. 3, 7; XXXVIII. 11; LXIX. 9. **Cumberland**, XXXIII. 12; XXXIV. 1; LXIII. 10; XLIV. 10, 11, 12; LXV. 7, 10, 12, 16; LXVII. 5, 8, 9, 10, 11, 14; LXVIII. 9; LXXI. 3; LXXII. 3, 4. **Derbyshire**, XXXIII. 6, 9, 10, 11; XXXIV. 6, 9, 10, 11, 12. **Denbighshire**, IV. 14, 15; V. 5, 6. 9, 13, 14; VIII. 3, 8, 10; IX. 5, 6, 7, 9, 10, 11, 13, 14; XIV. 1, 3, 5, 6, 7, 10, 11; XV. 11; XX. 2; XXI. 13, 14, 15; XXII. 11, 13, 15; XXVII. 2, 3, 4, 7, 8, 12; XXVIII. 9, 11, 13, 16; XXIX. 12; XXXV. 4, 8, 12; XXXVI. 9. **Flintshire**, I. 2; II. 9, 13; IV. 3, 5, 6, 9, 10, 11, 13, 14, 16; V. 1, 9; VII. 3, 8; VIII. 1, 5, 6, 7, 8, 9; XII. 3; XIII. 6, 11, 12; XIV. 6; XVII. 13, 14, 15; XVIIA. 13; XVIII. 4; XX. 12, 16; XXIII. 6. **Glamorganshire**, XV. 13; XVI. 13; XVII. 6, 9, 10, 11, 15; XXIV. 1, 5; XXV. 6, 13; XXVI. 8, 12, 16; XXXIII. 1; XXXIIIA. 4; XXXIII. 6, 10, 11, 12, 14; XXXIV. 4, 8, 12, 13, 15; XL. 1, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15; XLIV. 4; XLV. 9; XLIX. 2, 5, 6, 7, 12. **Oxfordshire**, XXIV. 3, 4; XXV. 1, 2, 3; XXVI. 15, 16; XXVII. 13, 14, 16; XXVIII. 1, 2, 3, 13, 14, 15; XXXI. 8; XXXII. 8, 12, 16; XXXIII. 1, 2, 3, 4, 6, 7, 8, 12; XXXIV. 1, 3, 5, 8, 9; XXXVIII. 4, 8; XXXIX. 2, 7, 12, 16; XLV. 4; LVI. 13, 14; LVII. 13. **Staffordshire**, III. 2, 3, 6, 7, 10, 11, 13, 14, 15, 16; VII. 1, 2, 3, 6, 10; VIII. 10; IX. 14; XI. 4; XII. 2, 3, 4, 8, 12; XIII. 5, 9; XIV. 3, 6, 7. **Sussex**, LVIII. 5; LXXVIII. 2, 4; LXXIX. 1, 9, 10, 13, 14; LXXX. 2, 3 and 4, 7, 13, 14. **Westmoreland**, V. 6. *3s. each.*

(E. Stanford, Agent.)

England and Wales. **Johnston.**

W. & A. K. Johnston's "Three Miles to Inch" Map of England. Scale 1 : 190,080 or 3 stat. miles to an inch. W. & A. K. Johnston, Edinburgh and London, 1899. Sheets 1, 2, 3, 19, 20, 21, 24, 25. *Presented by the Publishers.*

The principal feature in this map is the manner in which all the main roads are distinguished by being coloured brown. Some heights above sea-level are given in figures, but there is no hill shading.

Glasgow. **Bartholomew.**

Cyclist's Road Map of Glasgow District. Scale 1 : 126,720 or 2 stat. miles to an inch. J. Bartholomew & Co., Edinburgh, 1899. *Price* 1*s.*, mounted on cloth. *Presented by J. Bartholomew & Co.*

Historical Atlas. **Poole.**

Historical Atlas of Modern Europe from the Decline of the Roman Empire; comprising also maps of parts of Asia and of the New World connected with European History. Edited by Reginald Lane Poole, M.A., PH.D., Fellow of Magdalen College, and Lecturer in Diplomatic in the University of Oxford. Part xxiii. Oxford: The Clarendon Press; London, Edinburgh, Glasgow, and New York: Henry Frowde, M.A.; Edinburgh: W. & A. K. Johnston. 1899. *Price* 3*s.* 6*d.* *Presented by the Clarendon Press.*

Part xxiii. contains maps No. 38, 39, Germany, during the period of the Reformation and the Thirty Years' War, by the Rev. J. P. Whitney, M.A.; No. 81, Western Asia under the Turks and Persians, by Prof. S. Lane Pole, M.A. These maps are accompanied by explanatory letterpress.

Plymouth and Neighbourhood. **Bartholomew.**

Plan of Plymouth, Devonport, Stonehouse, and neighbourhood. Scale 6 inches to a mile. By J. Bartholomew, F.R.G.S. London: W. H. Smith & Sons, 1899. *Price 2s., mounted on cloth. Presented by J. Bartholomew & Co.*

ASIA.

Korea. **Japanese Government.**

Map of Korea and the neighbouring parts of China. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. From Japanese Government Surveys. 10 sheets. *Presented by the Japanese Government.*

This is a Japanese map of Korea and neighbouring parts of China, the lettering being in Chinese character.

AFRICA.

Transvaal. **Johnston.**

Map of the Transvaal, or South African Republic, and surrounding countries. Scale 1 : 1,900,800 or 30 stat. miles to an inch. W. & A. K. Johnston, Edinburgh and London. *Presented by the Publishers.*

AMERICA.

Canada. **Surveyor-General of Canada.**

General Map of the North-Western Part of the Dominion of Canada. Scale 1 : 2,217,400 or 35 stat. miles to an inch. Topographical Surveys Branch, Department of the Interior, Ottawa, 1898. *Presented by the Surveyor-General of Canada.*

This map has been compiled from observations and surveys by the Topographical Branch of the Department of the Interior, maps of the International Boundary Survey, maps of the Exploratory surveys by the Geological Survey Department, Admiralty Charts of the Polar Regions, general chart of Alaska by the United States Coast Survey, official maps of British Columbia, and other authentic sources. The region which this map includes is one of special interest at the present time, partly in connection with the Alaskan boundary dispute, and also in connection with the gold-mining industry. An inset map of the whole of the Canadian Dominion is given, showing the approximate areas of the different provinces.

AUSTRALIA.

Queensland. **Jack.**

Geological Map of Queensland. Scale 1 : 1,013,760 or 16 stat. miles to an inch. Compiled by Robert L. Jack, F.G.S., F.R.G.S., Govt. Geologist, 1899. Surveyor-General's Department, Brisbane. 6 sheets.

All persons interested in the geology and mining industry of Queensland will find this an interesting map. It appears to have been very carefully prepared, all the most recent and reliable material having been used in its compilation.

GENERAL.

World. **Meyer.**

Meyer's Hand-Atlas. Zweite, neubearbeitete und vermehrte Auflage mit 112 Kartenblättern, 9 Textbeilagen und Register aller auf den Karten verzeichneten Namen. Parts 17 to 20. Leipzig und Wien. Verlag des Bibliographischen Instituts, 1899. *Price* 30 *pf. each part.*

CHARTS.

Pacific Ocean. **The Indiarubber, Gutta-percha, and Telegraph Works Co.**

Charts of the Pacific Ocean. Compiled from Admiralty Surveys and other Official Sources by the Indiarubber, Gutta-percha, and Telegraph Works Co., Silvertown. J. D. Potter, London, 1899. *Presented by M. H. Gray, Esq.*

This chart has been compiled from the Admiralty surveys and other official sources by the Indiarubber, Gutta-percha, and Telegraph Works Co. As many soundings as possible along the route of the proposed Pacific Cable have been given, the intention being to show on one chart what could otherwise only be seen on several. Owing to the want of space, many deep-sea soundings south of the Sandwich islands have had to be omitted, but those shown give a fair general idea of the depth. All the deepest soundings are marked.

United States Charts. **U.S. Hydrographic Office.**

Pilot Charts of the North Pacific Ocean for August and September, 1899, and of the North Atlantic Ocean for August, 1899. Published at the Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Caucasus. **Déchy.**

Seventy-seven Photographs of the Caucasus, by M. Maurice de Déchy, 1897–98. *Presented by Mon. Maurice de Déchy.*

This set of photographs is a further contribution from M. Déchy, who has already presented the Society with numerous photographs of the Caucasus. Most of them are remarkably good specimens. The following is a list of the subjects :—

(1) Glacier on the north side below the Klukhor pass, Western Caucasus; (2) View from the Klukhor pass towards the south; (3) Mountains of the Klukhor group, seen

from the north side below the Klukhor pass; (4) Klukhor group: the Dombai-ulgen glacier; (5) Klukhor group: Alibek mountains and glacier, from the Amanaus valley; (6) Glaciers descending into the Amanaus valley; (7) The Klukhor group from the upper Teberda valley; (8) In the Teberda valley: view of Klukhor group, Belalakaja and Amanaus glaciers; (9) Belalakaja, from the Amanaus valley; (10) Klukhor group, seen from the rest-house on the north side of the Klukhor pass; (11) Ice lake on the Klukhor pass; (12) View from the upper Klush valley; (13) Daghestan, the valley above Khonokh, Eastern Caucasus; (14) The Botshokh glacier, Daghestan; (15) Lake Kesenoi-am, Daghestan; (16) Bogos group from the range north of Aknada, Daghestan; (17) Village of Konada, Daghestan; (18) Western part of Bogos group, seen from south of Tindi, Daghestan; (19) Village of Aknada, Daghestan; (20) Village of Tindi, Daghestan; (21) Glaciers on the south side of the Klukhor pass; (22) On the way to the Gandarar pass; (23) View towards the south-east, from the Gandarar pass; (24) Elbrus seen from the slopes below the Chirikol pass; (25) In the Chirikol valley (side valley of the Ullukam); (26) The Chirikol glacier; (27) Ullukam valley; (28) Near Khursuk; (29) View towards the south from the Chirikol pass; (30) Shatil, village in the upper Argun valley, Eastern Caucasus; (31) Gorges of the Argun above Shatil; (32) Gorges of the Argun above Shatil; (33) View from the Kachulam pass; (34) View towards the south from the Kachulam pass; (35) The upper top ridge of Datakh-Kort; (36) Sharoi, Eastern Caucasus; (37) Camp in the upper Khonokh valley, Daghestan; (38) Camp below Kachu pass; (39) Karachai, from Uchkulan; (40) Gorge at junction of Tekho river with the Andiski-Koissu, Daghestan; (41) Gorges of Andiski-Koissu, Southern Daghestan; (42) Saltinski-Most (bridge), Tekho river, Daghestan; (43) The Khonokh glacier, Daghestan; (44) Leshgian of Tindi; (45) Group of Leshgians at the top of the house of the Naib of Tindi, Daghestan; (46) Escort in 1898, the Naib of Tindi at the head; (47) Karachai from the Uchkulan valley; (48) Karachai of Khursukh; (49) Chechen boys in woods near the Khonischali huts; (50) Chechen woman with child; (51) Leshgian woman from the Andiski-Koissu valley; (52) Kistians in the upper Alazan valley; (53) Leshgians from Konada village; (54) Donos mountain and glacier (north side), Eastern Caucasus; (55) Gorge of Sabakenis, Khevi river, Southern Daghestan; (56) Tushi, from upper Perikitelian Alazan valley; (57) Donos glacier, Perikitelian chain (north side); (58) Khargabe valley, Perikitelian chain (north side); (59 Glaciers, Perikitelian chain (north side); (60) Khulundoi village (Diklos mountains); (61) Datakh-Kort, highest summit Perikitelian chain (north side); (62) On the Kachu glacier, north side of Perikitelian chain; (63) Datakh glacier, Perikitelian chain (north side); (64) Parsma: village in the valley of the Perikitelian Alazan; (65) Upper valley of the Perikitelian Alazan; (66) Side valley of Perikitelian Alazan; (67) Chain of the Amigo Tave, seen from the Adzunta pass; (68) Tebulos mountain, seen from the upper green slopes on the north side of the Adzunta pass; (69) Gorge of the Kharokis-Skali, near Muzo (Argun river system); (70) View towards the east (Tebulos group), from the Anatoris pass; (71) Kachu glacier, Perikitelian chain (north side); (72) North side of Perikitelian chain, from a corner on entering the Donoilam valley; (73) Selis mountain, from the west slope below the Shibe pass, Khevsurian alps; (74) Khevsurians from village of Shatil; (75) Khevsurians from village of Guri; (76) Sunni Leshgians from Echeda village, Andiski-Koissu valley; (77) No title.

Hungary. **Geographical Institute of the Royal Hungarian University.**

213 Photographs of Hungary, taken by the Geographical Institute of the Royal Hungarian University, Budapest. *Presented by the Geographical Institute of the Royal Hungarian University.*

As will be seen by the following list, this is a very complete and interesting set of photographs taken in Hungary:—

(1) View of Budapest; (2) Block of travertine near Budapest; (3) Cave at the foot of the Gellerthgi, Budapest; (4 and 5) Quarries, Kis-Gellerthgi, Budapest; (6) Lake in park of Budapest; (7) Hot spring of O'Buda, from which the water was led in Roman times to Acquincum; (8) Excavations of Acquincum, near Budapest; (9) Limestone quarries, Budapest; (10 to 12) Limestone quarries at Bia, county of Pest; (13) Limestone quarries at Sóskút, Teher; (14 and 15) Quarries and concentric layers of andesite, county of Pest; (16) Andesite-conglomerate at Pomaz, county of Pest; (17) Ruins of Visegrad Castle, near Budapest; (18 and 19) Gorge of the Danube between Visegrad and Nagy-Maros; (20) Torrent in loess and red clay, Nagy-Maros, county of Hont; (21) Szokola-Huta, county of Hont; (22) Vichne, county of Bars; (23 to 25) Old landslips at Vichne; (26) Ruins of old castle at Nográd; (27) Gorge of Szádelo, county of Abaúj-Torna; (28) Sugar-loaf rock, county of Abaúj-Torna; (29) Arm of the Danube at Dömsöd, county of Pest; (30) Poplar trees at Dömsöd; (31 and 32) Shifting sand, Vadkert, county of Pest; (33) Diluvial loess at Szabadka, county of

Bács-Bodrog; (34) Peasant house with a stork's nest, Domsod; (35) Shed at Puszta-Apaj, county of Pest; (36) Cattle at Puszta-Apaj; (37) Wooden bridge over the Tisza at Zenta, county of Bács-Bodrog; (38) Old oaks on the Alföld at Tamásda, county of Bihar; (40) Roman mound near Deliblat, county of Temes; (41) Town Hall and park, Arad; (42) Park at Kis-Teno, county of Arad; (43) Torrent at Paulis, county of Arad; (44) Artesian well at Elek, county of Arad; (45) Farm at Kis-Feno, county of Arad; (46) View looking towards plains of the Alföld, Radna; (47) Mária-Radna, with church and monastery, county of Arad; (48) Gorge of Solymos, county of Arad; (49) Royal school of viticulture, Ménes, county of Arad; (50 and 51) Andesite-conglomerates, county of Arad; (52) Spheroidal Diabas, county of Arad; (53) Katravotron, called Cimpanyászka, near Vaskoh, county of Bihar; (54 and 55) Spheroidal basalt, Lukarecz, county of Témes; (56 to 58) Hungarian types from Pécska, county of Arad; (59) Flour mill near Szlatina, county of Arad; (60 to 63) Roumanian types, county of Arad; (64) Town of Vajda-Hunyad; (65) Market-place of Vajda-Hunyad; (66) View of the Retyezát mountains from the north, county of Hunyad; (67) Sunrise in the Retyezát; (68) Rock scenery on the Steveiŭ peak, county of Arad; (69) Lake Bukura with the Steveiŭ peak, Retyezát mountains; (70 and 71) Lake Zenoga, Retyezát mountains; (72) Pelaga peak with Lake Pelaga, Retyezát mountains; (73) Outflow of the Pelaga; (74) Water-percolation in rock in bed of the Lepusuyik river near Malomviz, county of Hunyad; (75) Old church of Boldogfalva, county of Hunyad; (76) Ruins of Ulpia Trajana, county of Hunyad; (77) Greek Oriental Catholic Church, Demsus, county of Hunyad; (78) Quarries in iron ore, Gyalár, county of Hunyad; (79) Wooden cross and chapel at Gyalár, county of Hunyad; (80 and 81) Mundra peak, Paring mountains, county of Hunyad; (82) Northern slope of the Paring mountains; (83) Transylvanian gold-mining district, county of Hunyad; (84) Limestone cliff, Strimba, near Körösbánya, county of Hunyad; (85) Szekeremb, county of Hunyad; (86 and 87) Barsa gold-mine, near Ruda, county of Hunyad; (88) Csetrás Boicza and Nagyág mountains, county of Hunyad; (89) Town of Boicza; (90) Trachyte dome near Boicza; (91) Landslip near Boicza; (92) Landslip at Krecsunyesd, near Boicza; (93) Holes in hard trachyte at Kristyor, county of Hunyad; (94) Landscape near Boicza; (95) Town of Déva, on the Maros, county of Hunyad; (96 and 97) Volcanic cone at Déva; (98 to 102) Summit of Mount Vulkan, counties of Hunyad and Alsó-Fehér; (103) Waterfall near the village of Vulkan, county of Hunyad; (104) Northern slope of Mount Vulkan, county of Alsó-Fehér; (105) Town of Abrudbánya, chief place of the gold-mining district of Transylvania, county of Alsó-Fehér; (106) Mining village of Yzbita, county of Alsó-Fehér; (107) Vulkoj gold-mine, county of Alsó-Fehér; (108) House of rich Roumanian gold-miner, Bucsum-Yzbita; (109) Gold-stamping mill at Vulkoj; (110) Native gold-stamping mill, Verespatak, county of Alsó-Fehér; (111 to 113) Detunata basalt cones, Bucsum; (114) Torda gorge, county of Torda-Aranyos; (115 to 118) Lake Gyilkostó, county of Csik; (119 and 120) Egyeskö peak, Nagy-Hagymás range, county of Csik; (121) Detritus cones in torrents of the Öcsémtetö, county of Csik; (122) Alpine huts at Fehérmezö, Nagy-Hagymas mountains; (123) Scenery near Zsédánypatak, county of Csik; (124) Large jurassic block, Zsédánypatak; (125) Greek Oriental Catholic church, Zsédánypatak; (126 and 127) Crater lake of Szt Anna, near Tusnád, county of Csik; (128) Entrance of the cave of Torja, county of Háromszék; (129 and 130) Travertine walls, Borszek, county of Csik; (131 and 132) Weathered rock salt, Szováta, county of Maros-Torda; (133) Salt rock with cave, Parajd, county of Udvarhely; (134) Greek Oriental Catholic church, Magyar-Gorbó, county of Kolozes; (135) Entrance to natural tunnel of a brook near Kapriora, county of Krassó-Szörény; (136 and 137) Entrance of gorge of Kazan, near Orsova, Lower Danube; (138) Landscape in Dalmatia between Spalato and Trau; (139) Abbey of Zircz, county of Veszprém; (140) Town of Vesprém; (141) Volcanic hills of Badacsony, Szigliget, Gulácshegy, etc., county of Zala; (142) Basalt cone of Badacsony, with vineyards, Lake Balaton; (143 to 145) Columnar and tabular basalt on the northern slope of the Badacsony; (146 to 151) Basaltic cone of Szent-György, near Lake Balaton; (152 to 154) The basaltic cone of Gyulakeszi, with the ruins of the castle Csobáncz, near Lake Balaton; (155) Basaltic cone of Hegyestü, Zanka, near Lake Balaton; (156) Basaltic cone of Gulácshegy, near Lake Balaton; (157 and 158) Basaltic cone, Tóthihegy, near Lake Balaton; (159) Volcanic cone of Haláphegy, near Tapolcza, county of Zala; (160) In the woods of the dolomite hills, near Keszthely, county of Zala; (161) Basaltic hill of Szigliget, Lake Balaton; (162) Warm lake at Tapolcza; (163 to 168) Village and abbey of Tihany, Lake Balaton; (169) Barátlakások caves on east side of Tihany; (170) Interior of old monks' dwellings, Tihany Peninsula; (171) Western side of Tihany peninsula, Lake Balaton; (172) Landslip, western side of Tihany peninsula; (173) Narrowest part of Lake Balaton; (174) Old Avorian mound, Tihany peninsula; (175) Landslip, western side of Tihany peninsula; (176) Sinter cones, Tihany peninsula; (177) Old geyser cone, Tihany peninsula; (178 and 179) Eastern shore of Lake

Balatan, county of Veszprém; (180 and 181) Landslip on eastern shore of Lake Balaton; (182) Port of Kenese, Lake Balaton; (183) Cave-dwelling family on eastern shore of Lake Balaton; (184) Almadi, Lake Balaton; (185) Petroleum motor-boat of the Balaton Committee of the Hungarian Geographical Society; (186) Village of Alsó-Eörs, Lake Balaton, county of Zala; (187) Portal of the old church at Telsö Eörs; (188 and 189) Villa in vineyards of Csopak, Lake Balaton; (190) Balaton-Füred, Lake Balaton; (191) Bath-house of Balaton Füred; (192) Ruins of old church near Aszófö, Lake Balaton; (193) Dry valley in triassic limestone near Dörgicse, county of Zala; (194) Curious sandstone formation at Kövágó-Eörs, county of Zala; (195) On the road to Tapolcza, county of Zala; (196) Peninsula of Szt. Mihály, Lake Balaton; (197) Ancient shore of Lake Balaton, county of Zala; (198) Ancient cliffs on the shore of Lake at Meszesgyörök; (199) Keszthely, Lake Balaton; (200 and 201) Warm lake, Hérviz, county of Zala; (202) "Scarecrow" in vineyards, Lake Balaton; (203) Yacht on Lake Balaton; (204 and 205) Limnograph apparatus, Lake Balaton; (206) Lake Balaton frozen over; (207 and 208) On the ice, Lake Balaton, in the winter 1892-93; (209 to 212) Ice-pressures on Lake Balaton; (213) Ice-pressures on Molo Siófok.

Persia, etc. **Sarre.**

Eighty-five Photogravures (with a route map) taken during Dr. Fr. Sarre's expedition through Transcaucasia, Persia, Mesopotamia, and Transcaspian region, 1897–98. Berlin, 1899. Verlag von Dietrich Reimer (Ernst Vohsen). *Price* 18 *marks. Presented by the Publisher.*

This album contains photogravures of the people and scenery of Transcaucasia, Persia, Mesopotamia, and the Transcaspian region. They are accompanied by explanatory letterpress, and a map on which the routes followed by Dr. F. Sarre are laid down. The titles of subjects are given below—

Transcaucasia.—(1–3) Delijane; (4) Chibukli pass; (5) Armenian peasants of the Chibukli pass; (6) Malakan village on Lake Sevanga; (7) Lake Sevanga; (8, 9) Erivan; (10, 11) Nakhchivan; (12) Julfa on the Aras (Araxes).

Persia.—(13) Tabriz; (14) From Tabriz to Ardebil; (15, 16) Ardebil; (17) From Ardebil to Zindjan; (18, 19) Zindjan; (20) Weramin; (21) Teheran; (22) Kum; (23) Kum market-place: snowstorm between Kum and Rahgird; (24, 25) Rahgird; (26–30) Sultanabad; (31–35) Dizabad; (36–38) Farasbhe; (39) Kangavar; (40–42) Sahna; (43, 44) Rock of Bisutun; (45) between Bisutun and Kermanshah; (46–48) Kermanshah; (49) Tak-i-Bostan; (50, 51) Hassanabad; (52) Miantak caravanserai; (53) Miantak; (54, 55) Scripul; (56) Tak-i-Girra pass; (57) Kasr-i-Shirin; (58) Turco-Persian boundary, Turkish Zaptieh.

Mesopotamia.—(59–61) Haditeh; (62) Anah: The caravan on the banks of the Euphrates; (63) Anah; (64) Salihieh; (65) ruins at Rahaba; (66) Rahaba.

Syria.—(67) between Deir and Kabakib; (68) Kisbla, from Bir Kabakib; (69, 70) Tadmor; (71) between Tadmor and Karietein; (72) Karietein; (73) between Karietein and Damascus.

Transcaspia Region—(74) On the railway platform at Askabad; (75) On a railway station in Bukhara; (76–84) Bukhara; (85) Samarkand.

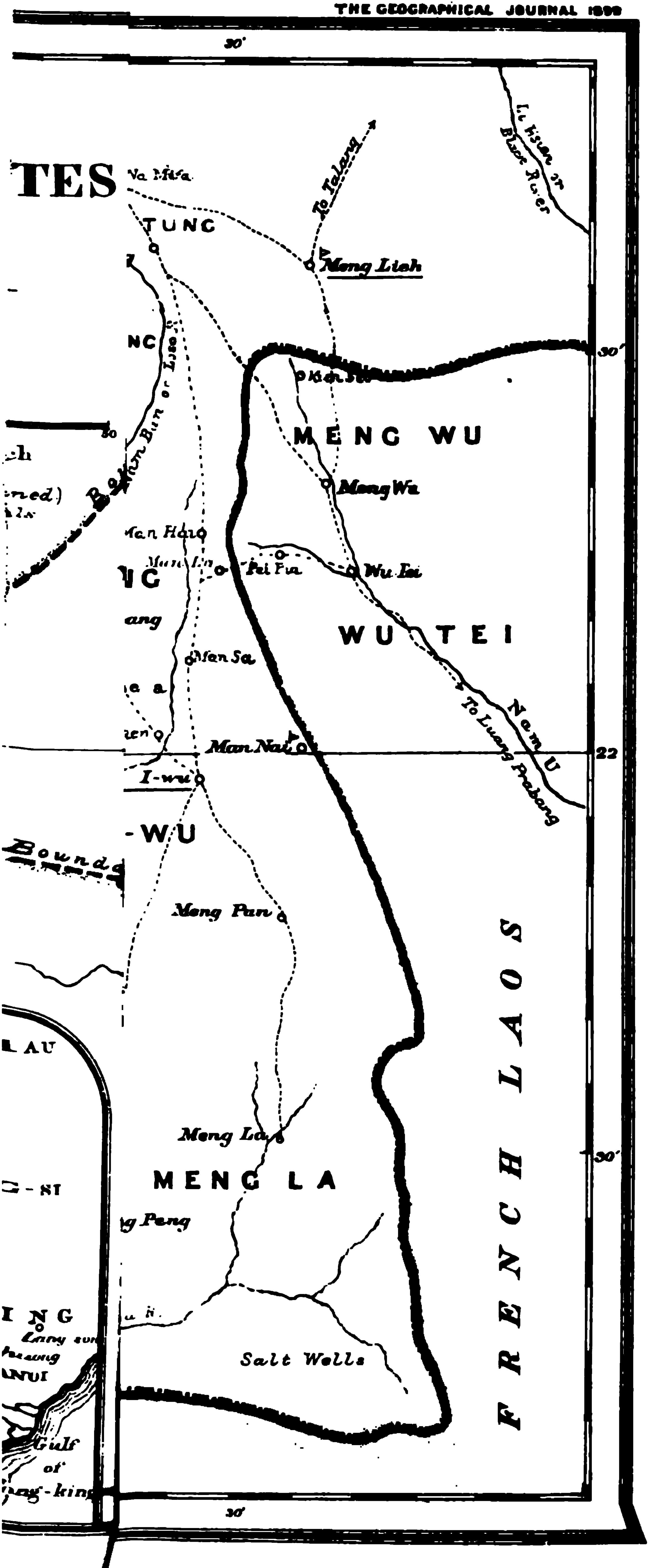
Victoria. **Caire.**

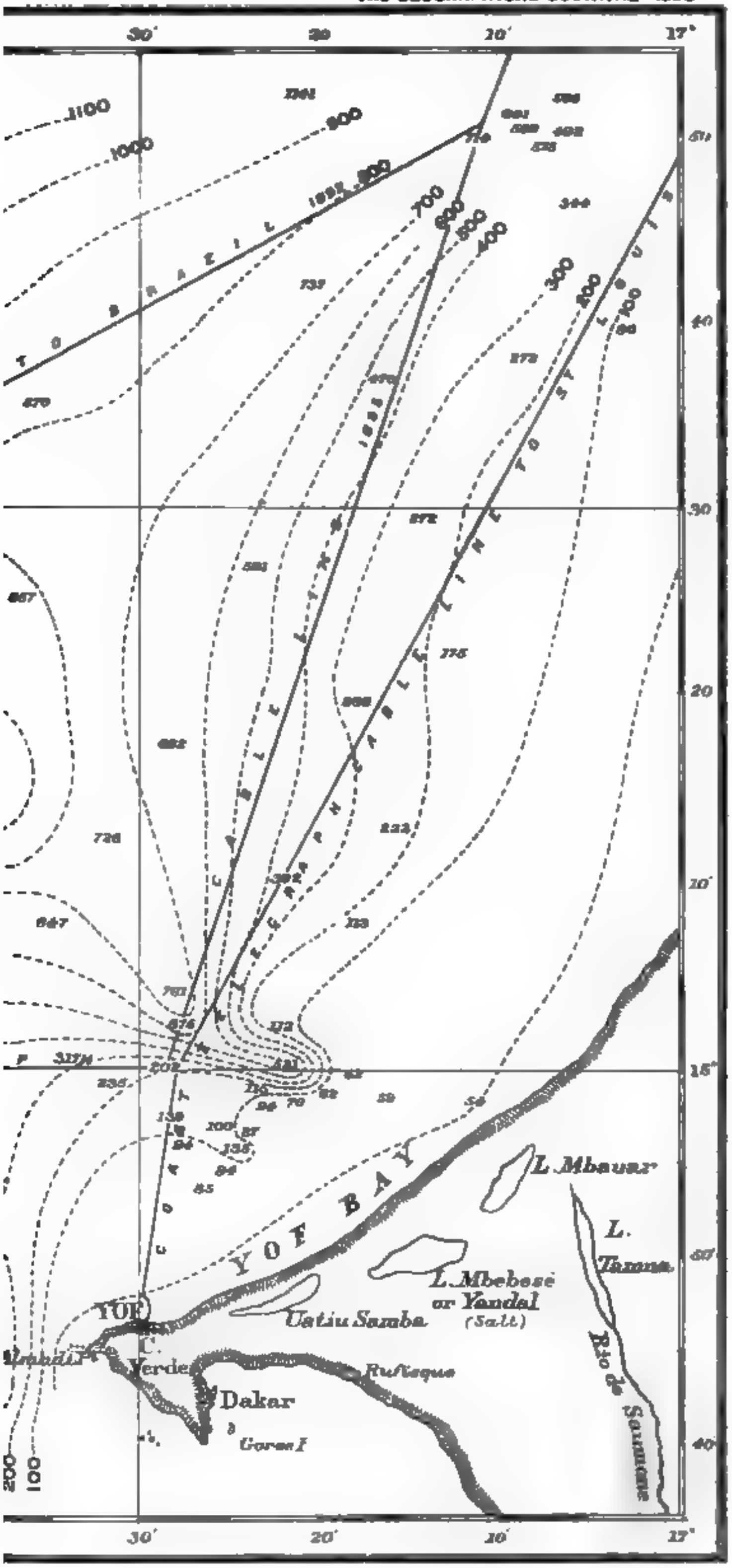
Sixteen Photographs of Victoria. By N. J. Caire, Victoria. *Presented by Dr. T. Hodgson.*

The subjects illustrated by this series include forest scenery and the incidents of life in the bush, as will be seen by the following list of titles:—

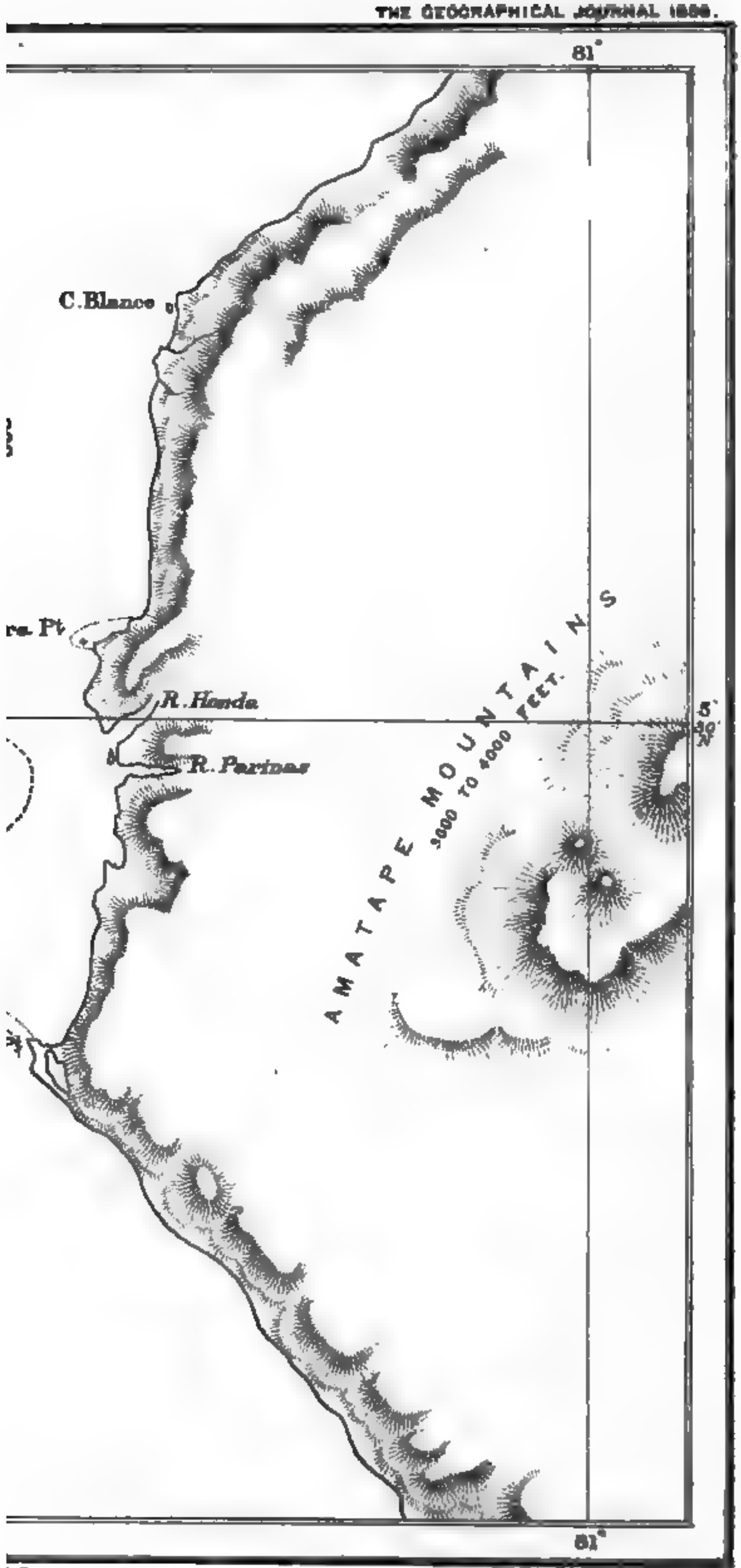
(1) Wombat gully, Fernshaw; (2) cutting up a giant tree, Fernshaw; (3) Syncoma hill, Black Spur, Fernshaw; (4) Fairy scene, Black Spur, Fernshaw; (5) Scene near Lilydale; (6) Bush and hut, Gembrook; (7) Tree-felling, Gembrook; (8) Coal-mine, Yarragon, Gippsland; (9) Bush and huts, Gippsland; (10) Giant tree at Nurim, 48 feet girth, 325 feet high; (11) Pass top of Mount Strezlecki; (12) Fern bower, Hasledene, Gippsland; (13) Sundowners who live in hollow tree; (14) Lubra's camp; (15) Scene on the Yarra at Coranderrk; (16) "Too late!"

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.


TES
TUNG
Meng Lieh
To Talang
Li Hsien or Black River
MENG WU
Meng Wu
Wu Tei
Pei Pia
WU TEI
Nam U
To Luang Prabang
Man Hao
Man Sa
Man Nai
I-wu
-WU
Meng Pan
Meng La
MENG LA
Salt Wells
FRENCH LAOS
Gulf of
22
30'


30'
20'
10'
17°
1100
1000
900
800
700
600
500
400
300
200
100
YOF BAY
L. Mbauar
L. Tamna
L. Mbebese
or Yandal
(Salt)
Uatiu Samba
YOF
C. Verde
Dakar
Rufisque
Goree I
Rio de Saumme

al Society


81°
C. Blanco
Pt
R. Honda
R. Parinas
AMATAPE MOUNTAINS
3000 TO 4000 FEET.
5°
30'
81°
Society

All depressions
termed Deeps r

50 60

The

Geographical Journal.

No. 5. NOVEMBER, 1899. Vol. XIV.

THE ANTARCTIC EXPEDITIONS.*

By Sir CLEMENTS MARKHAM, K.C.B., President of the Royal Geographical Society of London.

The projected exploration of the regions beyond the antarctic circle will, it is hoped, be undertaken simultaneously by two well-equipped expeditions sent out by England and Germany, and it is clearly most desirable that a plan of co-operation should be arranged.

I propose in this communication to consider the geographical work that will be before the expedition; to explain the course pursued by the Royal Geographical Society of London in promoting the English enterprise and its present position; and to discuss the plans to be adopted for securing the results that are desired. Allowing for the enormous advantages we possess over our predecessor through the introduction of steam to its full extent, I do not disguise from myself that the undertaking is one of great difficulty and danger, and that a most serious responsibility devolves upon its promoters. I have used the word "predecessor" in the singular, because in point of fact there has, up to this time, only been one properly equipped antarctic expedition. Other exploring and whaling vessels have crossed the antarctic circle, and have gone as far as the ice allowed, or as their business seemed to require; but the ships of Sir James Ross were the only ones that were prepared for navigation *in* the ice, and the only sailing ships that have penetrated *through* the polar pack into the true antarctic region.

* Paper read at the International Geographical Congress, Berlin, September 29, 1899.

One expedition, consisting of two slow sailing-vessels, is our predecessor. It is true that that one expedition did splendid work, and made great discoveries; but its means were very limited. In two seasons Sir James Ross twice penetrated through the polar pack, in the third season he failed probably because the attempt was made too late. This is all that has yet been done, and it shows how vast and how important is the area to be explored.

I propose, with a view to greater clearness, in discussing the probable work to be done in the unknown region, to consider it as divided into *four quadrants*—two on the Australasian side, and two on the Cape Horn and Cape of Good Hope side.

To the first quadrant on the Australasian side, from 90° E. to 180°, I propose to give the name of VICTORIA, as it includes Victoria Land. In the second, from 180° to 90° W., Cook and Ross alone have penetrated beyond the 70th parallel. It includes above half of the known part of the great ice-barrier; but the only known land within it is Peter island, discovered by Bellingshausen in 1821. It might appropriately have the name of SIR JAMES ROSS. The first quadrant on the Cape Horn and Cape of Good Hope side extends from 90° W. to the meridian of Greenwich. It includes the winter quarters of Gerlache, islands seen by Bellingshausen, Biscoe, and Larsen, and the part of the southern ocean in which Weddell penetrated to 74° 15′ S. It might properly be called after WEDDELL. The fourth quadrant, or the second on the Cape Horn and Cape of Good Hope side, extends from the meridian of Greenwich to 90° E., and is the least known. Here the 70th parallel has never been crossed; and distant land on the antarctic circle has only been sighted; namely, Enderby Land and Kemp Land. This quadrant might receive the name of, provisionally, ENDERBY, or of *Valdivia* after the German ship which approached Enderby Land this year. We thus have the unknown region divided into four quadrants.

Australasian side.	VICTORIA, 90° E. to 180°,	meridians of	Australia and New Zealand.
	ROSS, 180° to 90° W.	,,	Pacific ocean.
Cape Horn and Cape of Good Hope side.	WEDDELL, 90° W. to 0°	,,	Cape Horn.
	ENDERBY, 0° to 90° E.	,,	Cape of Good Hope.

The VICTORIA QUADRANT first presents, for examination, the lands sighted by Balleny and Dumont D'Urville from 118° E. to the Balleny islands in 162° E.; namely, Adelie and Sabrina lands. It has been conjectured that these lands form the coast of a continuous continent, because they were sighted on nearly the same parallel, near the antarctic circle. A reconnaissance south from the *Challenger's* furthest point, in 64° S., 94° 30′ E., another along

the antarctic circle, and a third south-west from the Balleny islands, would probably settle this question, and lead to numerous scientific results. Still more important work will await the explorers in Victoria Land. It is not certain whether the land from Cape Adare, in 71° 18′ S., to Cape Washington, in 74° 37′ S., is continuous with the Victoria Land of Mounts Erebus and Terror, or whether it is an island. No land was seen between Capes Washington and Gauss; but Sir James Ross believed it to be continuous, on account of the massive character of the mountains on either side. This question must be decided.

At the angle in 77° S., where the great volcano was seen by Ross, and near which the ice-barrier commences, there is an indentation of the coast, which was named McMurdo bay. It seems probable that anchorage may be found there, and that a station may be established, whence a travelling party or parties may explore the volcanic region and the edge of the ice-cap, and even undertake journeys in the direction of Ross's position of the magnetic pole, and southwards towards the south pole.

The organization of a land exploring party will require very careful consideration. It is most likely that the travelling will be over glaciers, with some mountain climbing. The low atmospheric pressure maintained in all seasons south of 40° S. has led to the conjecture that a large anti-cyclone, with a higher pressure, overspreads the area south of 74° S., where the precipitation will not be so excessive. In that case it is possible that the conditions for travelling will not be intolerable. The country will, however, be without resources, and the most exact calculations must be made with regard to provisions, loads to be drawn, depôts, and weights.

In recent times much reliance has been placed upon dogs for arctic travelling. Yet nothing has been done with them to be compared with what men have achieved without dogs. Indeed, only one journey of considerable length has ever been performed, in the arctic regions, with dogs—that by Mr. Peary across the inland ice of Greenland. But he would have perished without the resources of the country, and all his dogs, but one, died owing to overwork, or were killed to feed the others. It is a very cruel system, and dogs are useless in rough ice or on broken ground. Men, on the other hand, are good everywhere, and the amount of provisions required by them, to go for a certain number of days and return, can be exactly calculated with regard to the weight to be drawn by each man. Sir Leopold M'Clintock in 1853, during an absence from his base of one hundred and five days, led a party of six men over 1210

miles at a rate of 10·4 miles a day, partly across land, partly over heavy ice. In 1854, after a second winter, Lieutenant Mecham, during seventy days, travelled over 1157 miles, much of it over very heavy rough ice, at the extraordinary rates of 16 miles a day out, and 20½ miles a day, for thirty-three days, in returning. He had seven men who were each dragging 255 lbs. at starting.

With such leaders as M'Clintock and Mecham, and such men as served under them, it will be seen that the distance of Ross's magnetic pole from McMurdo bay and back could very easily be covered in three months, without the cruelty of killing a team of dogs by overwork and starvation. The scientific value of the results obtained by such a party would be very great. If, as seems probable, the volcanic mass, culminating in Mount Erebus, rises from the plain on which the ice-barrier rests, not only might the volcanic region be explored, but the character and rate of motion of the ice-cap might be ascertained by borings, and other methods of measurement.

The ice-barrier, probably 1600 feet in perpendicular height, of which 150 to 200 feet are above the sea, would receive careful examination from the ship, with the aid of a captive balloon.

The Ross Quadrant (180° to 90° W.) contains the continuation of the ice-barrier, and a principal aim of the expedition would be to ascertain its extent, and the outline of the continental land on the Pacific side; as well as to make a determined effort to explore it, as far as the meridian of Peter island.

The Weddell Quadrant (90° W. to 0) invites discoveries of peculiar interest, including the southern side of Graham Land if it proves to be an island, and still more valuable discoveries if it is found to be a promontory extending from continental land. Sir John Murray, in a paper read before the Royal Geographical Society on November 27, 1893, adduced some reasons for thinking that on this side of the antarctic regions the land might partly consist of metamorphic and even sedimentary rocks. Soundings by Mr. Bruce indicated their presence. Fossils, probably of lower tertiary age, have been found on Seymour island: and Captain Larsen, of the Norwegian whaler *Jason*, picked up fossil coniferous wood on the east side of Graham Land. Holes were found perforated in this wood, filled with white lime, which led Sir Archibald Geikie to form the opinion that it had been driftwood. But whence came this driftwood of remote times, and what is the history of the ancient current which brought it, are questions of the deepest interest. These considerations show the importance of discovery southwards from Graham Land. There has been volcanic action on this Cape

Horn side, as well as on the Australian side, and Captain Larsen discovered an active volcano. Still, volcanic areas may, and probably do coexist with surrounding rocks of a metamorphic or sedimentary character.

In this quadrant, also, is the meridian of 35 W. down which Captain Weddell sailed in February, 1823, without obstruction from ice, to 74° 15′ S., and saw no icebergs and nothing to prevent his further progress. He was whaling, and returned because there was a south wind impeding his progress. It is conjectured that he was approaching land. If so, it was not a land bordered by the great ice-barrier, but a more accessible region which does not generate icebergs. Ross, in 1843, attempted to go south, a little to the east of Weddell's meridian, and encountered a pack which his ships could not penetrate; but it was a month later, in March. When Weddell made his southward voyage in February, the pack had not yet drifted north. The pack which Ross encountered in the Weddell sea, may not, however, be the result of a summer northern drift of the winter's ice. It is Sir Joseph Hooker's impression that it was too dense for that, and there was never a trace of water-blink over it. The pack appears to move over enormous areas of open sea, blocking them up for indefinite periods. Ross found 8 miles of pack blocking the approach to Cape Adare, where there was none this year. The same conclusion is to be derived from the positions in which the pack-ice was found by Bellingshausen and Balleny.

I am myself inclined to think that the continental land comes furthest north in 50° E. and 140° W.; and is much more to the south on the meridians of the Weddell Sea, and of the supposed continent of which Sabrina and Adelie lands are conjectured to be parts; though there are probably archipelagoes of islands. The isotherm of 32° Fahr. (0° Celsius) air-temperature in January and February is as far north as 54° S. on the meridian of Greenwich, and thence to 80° E., and also in the Pacific; while from 80° E. to 140° E., and from 45° W. to 90° W. the same isotherm is in 63° S. Where the isotherm comes furthest south, the region must be warmer, and colder where it goes north to 54° S. It is possible that this may be caused by the proximity or distance of frozen land-masses, in which case the form of the antarctic continent would be as I have indicated.

However this may be, what has been called the "Weddell Sea" certainly offers a splendid field for research and discovery; and an expedition penetrating in this direction should be prepared to land a well-equipped party to explore this side of the continent.

The Enderby Quadrant, from 0° to 90 °E., has only been entered by Biscoe in February, 1831, who discovered Enderby Land. Captain Cook just crossed the antarctic circle in 1773, as did Moore in 1845 at nearly the same place, and the *Challenger* in 1874. All to the south of the antarctic circle, in this quadrant, is absolutely unknown, and invites discovery. Yet some indications of the nature of the land in this quadrant were obtained by the *Valdivia* when she approached Enderby Land this year, in the shape of specimens of gneiss, granite, schist, and red sandstone. Here I cannot refrain from offering my congratulations to my German colleagues on the admirable skill and ability with which the *Valdivia* expedition was conducted, and on its success.

It will be seen that the four quadrants into which, for convenience of description, I have divided the antarctic regions, all present problems of intense interest and vast areas for discovery.

The vessel which prosecutes the proposed discoveries will take magnetic and meteorological observations, and deep-sea soundings and dredgings as frequently as is compatible with the main objects of the expedition; which will be "to determine, as far as is possible, the extent and nature of the south polar land, to ascertain the nature of its glaciation, and to take magnetic and meteorological observations." *

In November, 1893, the President and Council of the Royal Geographical Society of London determined to promote the cause of antarctic exploration in earnest, with a determination to persevere until the object was attained. It was felt that a thoroughly efficient expedition must consist of two vessels commissioned by the Government, officered and manned by the navy, and under naval discipline. After a considerable lapse of time our Government came to a decision, and declined to undertake an enterprise of such magnitude. The Geographical Society, having secured the co-operation of the Royal Society and the approval of all the other scientific bodies of the kingdom, then resolved to appeal to its Fellows for funds to enable an antarctic expedition of less magnitude, consisting of one vessel, to be fitted out, if sufficient funds could not be collected for two vessels. The appeal was made, and the result up to the present date has been a subscription of £40,000.

* Report of the R.G.S. Antarctic Committee, consisting of Sir Joseph Hooker, Sir Clements Markham, Sir Leopold M'Clintock, Sir R. Vesey Hamilton, Sir George Nares, Sir William Wharton, Sir Erasmus Ommanney, Sir John Murray.

One generous and public-spirited Fellow of the Royal Geographical Society, Mr. Longstaff, subscribed a sum of £25,000. The enterprise was cordially supported by the press, and, seeing the importance that was attached to it by public opinion, H.M. Government has been induced to grant annual sums so as to double the amount raised by private subscriptions.

During the six years that have elapsed since the Geographical Society of London began its antarctic crusade in 1893, the subject has been very carefully studied in all its details. The known facts have been collected and compared respecting antarctic meteorology; the character and position of the south polar pack in different seasons, and in different times of the same season, have been considered; and comparisons have been made between the ice and ice-navigation in the arctic and antarctic regions. These materials have led us to decisions respecting the vessel and its equipment, the organization of land-parties, and the general scheme of work for the expedition; with reference to the funds at present at our disposal.

The vessel for the expedition will be built of oak, with ice-casing of greenheart, or of some other harder wood. She will be 172 feet long by 33 broad, with a displacement of about 1570 tons. She will carry 240 tons of coal, and will have an engine of 450 horse-power. The bows will be specially strengthened, sharp, and overhanging for charging the ice and forcing a way through it. The stern and counters will be designed for giving as much protection as possible to the rudder and propeller, which will be fitted for raising quickly. The engine will be right aft, so as to admit of a magnetic observatory being built before the mainmast, which shall have no iron within 30 feet. Melbourne will be the base for magnetic observations. Provision will also be made for deep-sea sounding and dredging; there will be two houses on deck for biological work, and a laboratory below. There will be accommodation for six executive officers, including an engineer, three civilians for physical and chemical research, for biology and geology, including the surgeon, and thirty-nine men. The scientific staff will consist of the captain and leader of the expedition, and of four officers, who will have charge of the navigation, celestial, meteorological, and magnetic observations, surveys, and deep-sea sounding and dredging; and of three civilians.

The ship will be prepared for wintering, and extensive land journeys are contemplated.

I presume that, the objects being identical, the vessel and

arrangements of the German expedition will be analogous. The most valuable form that co-operation can take will be the exploration of so much as is possible of all the four quadrants into which I have divided the unknown region, two being taken by the English, and two by the German expedition. Another valuable result of co-operation will be the series of simultaneous meteorological observations.

All the four quadrants present work of the highest value, or I should rather say that all present equal opportunities for penetrating into the unknown, and for making discoveries of the greatest value to science, and which combined will materially increase our knowledge.

On the antarctic map which was sent to us from Berlin some months ago, two lines were drawn to show the suggested routes of the English and German expeditions. The English line extends from 90° E. to 90° W., and the German line from 90° W. to 90° E. In other words, the suggestion is that the English should take the VICTORIA and ROSS quadrants, and the Germans the WEDDELL and ENDERBY quadrants.

I do not see how this suggestion could be improved, with a view to the most comprehensive and useful co-operation between the two expeditions. In the event of its adoption, both expeditions would start from the Thames and the Elbe in August, 1901. The English vessel would go to her magnetic base at Melbourne. Thence she would proceed to the exploration of the islands or continental land from 90° to the Balleny islands. This completed so far as may be possible, she would press on through the polar pack, examine the gap between Capes Washington and Gauss of Victoria Land, and establish the landing-party in McMurdo bay, at the foot of Mount Erebus. She would then return to her magnetic base, and afterwards proceed to Lyttleton, in New Zealand, to winter, as a more convenient starting-point.

In the second season the English vessel would force her way direct to McMurdo bay, take the landing party on board, and then examine the ice-barrier for its known length of 300 miles, and as far eastward and westward as the season will allow beyond that, again returning to Melbourne, then to Lyttleton. A captive balloon will be of material assistance in ascertaining the nature of the ice-barrier.

In the third season, if the funds admit of its being entered upon, a resolute and sustained effort would be made to continue the discovery of the line either of the ice-barrier or of the

continental coast, whichever it proves to be, along the Pacific to the meridian of Peter island.

Magnetic observations, deep-sea soundings, and dredgings would be taken throughout the three seasons; but, looking to the uncertain movements of the pack-ice, and to our ignorance of the conditions obtaining over the unknown area, a very wide discretion will be given to the leader of the expedition.

Simultaneously, the German expedition would proceed to its station at Kerguelen island, and thence to the scene of its labours, and, we hope, its discoveries. The ENDERBY or VALDIVIA and WEDDELL quadrants certainly comprise investigations of equal importance, including the discovery of that part of the continental land south of the Weddell sea, which is believed to comprise rocks other than volcanic. Here a landing-party will have work of even greater interest than that which lands in McMurdo bay. But it is not for me even to outline the contemplated German exploration, which has, doubtless, already been systematically planned by the able advisers of the expedition.

I believe that this great geographical enterprise is one of the most important that has ever been conceived. It will add largely to the sum of human knowledge, and, in many ways, will be of direct benefit to mankind. It is a beneficent work, a work which makes for peace and good fellowship among nations. It must rejoice the hearts of all geographers that the countrymen of Humboldt, of Ritter, of Kiepert, of Richthofen, and of Neumayer should combine with the countrymen of Banks, of Rennell, of Murchison, and of Sabine to achieve a grand scientific work which will redound to the honour of both nations.

THE GEOGRAPHICAL CYCLE.

By WILLIAM M. DAVIS, Professor of Physical Geography in Harvar University.

THE GENETIC CLASSIFICATION OF LAND-FORMS.—All the varied forms of the lands are dependent upon—or, as the mathematician would say, are functions of—three variable quantities, which may be called structure, process, and time. In the beginning, when the forces of deformation and uplift determine the structure and attitude of a region, the form of its surface is in sympathy with its internal arrangement, and its height depends on the amount of uplift that it has suffered. If its rocks were unchangeable under the attack of external processes, its surface would remain unaltered until the forces of deformation and uplift acted again;

and in this case structure would be alone in control of form. But no rocks are unchangeable; even the most resistant yield under the attack of the atmosphere, and their waste creeps and washes downhill as long as any hills remain; hence all forms, however high and however resistant, must be laid low, and thus destructive process gains rank equal to that of structure in determining the shape of a land-mass. Process cannot, however, complete its work instantly, and the amount of change from initial form is therefore a function of time. Time thus completes the trio of geographical controls, and is, of the three, the one of most frequent application and of most practical value in geographical description.

Structure is the foundation of all geographical classifications in which the trio of controls is recognized. The Alleghany plateau is a unit, a "region," because all through its great extent it is composed of widespread horizontal rock-layers. The Swiss Jura and the Pennsylvanian Appalachians are units, for they consist of corrugated strata. The Laurentian highlands of Canada are essentially a unit, for they consist of greatly disturbed crystalline rocks. These geographical units have, however, no such simplicity as mathematical units; each one has a certain variety. The strata of plateaus are not strictly horizontal, for they slant or roll gently, now this way, now that. The corrugations of the Jura or of the Appalachians are not all alike; they might, indeed, be more truly described as all different, yet they preserve their essential features with much constancy. The disordered rocks of the Laurentian highlands have so excessively complicated a structure as at present to defy description, unless item by item; yet, in spite of the free variations from a single structural pattern, it is legitimate and useful to look in a broad way at such a region, and to regard it as a structural unit. The forces by which structures and attitudes have been determined do not come within the scope of geographical inquiry, but the structures acquired by the action of these forces serve as the essential basis for the genetic classification of geographical forms. For the purpose of this article, it will suffice to recognize two great structural groups: first, the group of horizontal structures, including plains, plateaus, and their derivatives, for which no single name has been suggested; second, the group of disordered structures, including mountains and their derivatives, likewise without a single name. The second group may be more elaborately subdivided than the first.

The destructive processes are of great variety—the chemical action of air and water, and the mechanical action of wind, heat, and cold, of rain and snow, rivers and glaciers, waves and currents. But as most of the land surface of the Earth is acted on chiefly by weather changes and running water, these will be treated as forming a normal group of destructive processes; while the wind of arid deserts and the ice of

frigid deserts will be considered as climatic modifications of the norm, and set apart for particular discussion; and a special chapter will be needed to explain the action of waves and currents on the shore-lines at the edge of the lands. The various processes by which destructive work is done are in their turn geographical features, and many of them are well recognized as such, as rivers, falls, and glaciers; but they are too commonly considered by geographers apart from the work that they do, this phase of their study being, for some unsatisfactory reason, given over to physical geology. There should be no such separation of agency and work in physical geography, although it is profitable to give separate consideration to the active agent and to the inert mass on which it works.

TIME AS AN ELEMENT IN GEOGRAPHICAL TERMINOLOGY.—The amount of change caused by destructive processes increases with the passage of time, but neither the amount nor the rate of change is a simple function of time. The amount of change is limited, in the first place, by the altitude of a region above the sea; for, however long the time, the normal destructive forces cannot wear a land surface below this ultimate baselevel of their action; and glacial and marine forces cannot wear down a land-mass indefinitely beneath sea-level. The rate of change under normal processes, which alone will be considered for the present, is at the very first relatively moderate; it then advances rather rapidly to a maximum, and next slowly decreases to an indefinitely postponed minimum.

Evidently a longer period must be required for the complete denudation of a resistant than of a weak land-mass, but no measure in terms of years or centuries can now be given to the period needed for the effective wearing down of highlands to featureless lowlands. All historic time is hardly more than a negligible fraction of so vast a duration. The best that can be done at present is to give a convenient name to this unmeasured part of eternity, and for this purpose nothing seems more appropriate than a "*geographical cycle.*" When it is possible to establish a ratio between geographical and geological units, there will probably be found an approach to equality between the duration of an average cycle and that of Cretaceous or Tertiary time, as has been indicated by the studies of several geomorphologists.

"THEORETICAL" GEOGRAPHY.—It is evident that a scheme of geographical classification that is founded on structure, process, and time, must be deductive in a high degree. This is intentionally and avowedly the case in the present instance. As a consequence, the scheme gains a very "theoretical" flavour that is not relished by some geographers, whose work implies that geography, unlike all other sciences, should be developed by the use of only certain ones of the mental faculties, chiefly observation, description, and generalization. But nothing seems to me clearer than that geography has already suffered too long from

the disuse of imagination, invention, deduction, and the various other mental faculties that contribute towards the attainment of a well-tested explanation. It is like walking on one foot, or looking with one eye, to exclude from geography the "theoretical" half of the brain-power, which other sciences call upon as well as the "practical" half. Indeed, it is only as a result of misunderstanding that an antipathy is implied between theory and practice, for in geography, as in all sound scientific work, the two advance most amiably and effectively together. Surely the fullest development of geography will not be reached until all the mental faculties that are in any way pertinent to its cultivation are well trained and exercised in geographical investigation.

All this may be stated in another way. One of the most effective aids to the appreciation of a subject is a correct explanation of the facts that it presents. Understanding thus comes to aid the memory. But a genetic classification of geographical forms is, in effect, an explanation of them; hence such a classification must be helpful to the travelling, studying, or teaching geographer, provided only that it is a true and natural classification. True and natural a genetic classification may certainly be, for the time is past when even geographers can look on the forms of lands as "ready made." Indeed, geographical definitions and descriptions are untrue and unnatural just so far as they give the impression that the forms of the lands are of unknown origin, not susceptible of rational explanation. From the very beginning of geography in the lower schools, the pupils should be possessed with the belief that geographical forms have meaning, and that the meaning or origin of so many forms is already so well assured that there is every reason to think that the meaning of all the others will be discovered in due time. The explorer of the Earth should be as fully convinced of this principle, and as well prepared to apply it, as the explorer of the sky is to carry physical principles to the furthest reach of his telescope, his spectroscope, and his camera. The preparation of route-maps and the determination of latitude, longitude, and altitude for the more important points is only the beginning of exploration, which has no end till all the facts of observation are carried forward to explanation.

It is important, however, to insist that the geographer needs to know the meaning, the explanation, the origin, of the forms that he looks at, simply because of the aid thus received when he attempts to observe and describe the forms carefully. It is necessary clearly to recognize this principle, and constantly to bear it in mind, if we would avoid the error of confounding the objects of geographical and geological study. The latter examines the changes of the past for their own sake, inasmuch as geology is concerned with the history of the Earth; the former examines the changes of the past only so far as they serve to illuminate the present, for geography is concerned essentially with the Earth as it now exists. Structure is a pertinent element of geographical

study when, as nearly always, it influences form; no one would to-day attempt to describe the Weald without some reference to the resistent chalk layers that determine its rimming hills. Process is equally pertinent to our subject, for it has everywhere been influential in determining form to a greater or less degree, and it is everywhere in operation to-day. It is truly curious to find geographical text-books which accept the movement of winds, currents, and rivers as part of their responsibility, and yet which leave the weathering of the lands and the movement of land-waste entirely out of consideration. Time is certainly an important geographical element, for where the forces of uplift or deformation have lately (as the Earth views time) initiated a cycle of change, the destructive processes can have accomplished but little work, and the land-form is "young;" where more time has elapsed, the surface will have been more thoroughly carved, and the form thus becomes "mature;" and where so much time has passed that the originally uplifted surface is worn down to a lowland of small relief, standing but little above sea-level, the form deserves to be called "old." A whole series of forms must be in this way evolved in the life-history of a single region, and all the forms of such a series, however unlike they may seem at first sight, should be associated under the element of time, as merely expressing the different stages of development of a single structure. The larva, the pupa, and the imago of an insect; or the acorn, the full-grown oak, and the fallen old trunk, are no more naturally associated as representing the different phases in the life-history of a single organic species, than are the young mountain block, the maturely carved mountain-peaks and valleys, and the old mountain peneplain, as representing the different stages in the life-history of a single geographic group. Like land-forms, the agencies that work upon them change their behaviour and their appearance with the passage of time. A young land-form has young streams of torrential activity, while an old form would have old streams of deliberate or even of feeble current, as will be more fully set forth below.

THE IDEAL GEOGRAPHICAL CYCLE.—The sequence in the developmental changes of land-forms is, in its own way, as systematic as the sequence of changes found in the more evident development of organic forms. Indeed, it is chiefly for this reason that the study of the origin of land-forms—or geomorphogeny, as some call it—becomes a practical aid, helpful to the geographer at every turn. This will be made clearer by the specific consideration of an ideal case, and here a graphic form of expression will be found of assistance.

The base-line, $\alpha\omega$, of Fig. 1 represents the passage of time, while verticals above the base-line measure altitude above sea-level. At the epoch 1, let a region of whatever structure and form be uplifted, B representing the average altitude of its higher parts, and A that of its lower parts; thus AB measuring its average initial relief. The surface

rocks are attacked by the weather. Rain falls on the weathered surface, and washes some of the loosened waste down the initial slopes to the trough-lines where two converging slopes meet; there the streams are formed, flowing in directions consequent upon the descent of the trough-lines. The machinery of the destructive processes is thus put in motion, and the destructive development of the region is begun. The larger rivers, whose channels initially had an altitude, A, quickly deepen their valleys, and at the epoch 2 have reduced their main channels to a moderate altitude, represented by C. The higher parts of the inter-stream uplands, acted on only by the weather without the concentration of water in streams, waste away much more slowly, and at epoch 2 are reduced in height only to D. The relief of the surface has thus been increased from AB to CD. The main rivers then deepen their channels very slowly for the rest of their life, as shown by the curve CEGJ; and the wasting of the uplands, much dissected by branch streams, comes to be more rapid than the deepening of the main valleys, as shown by comparing the curves DFHK and CEGJ. The period 3–4 is the time of the most rapid consumption of the uplands, and

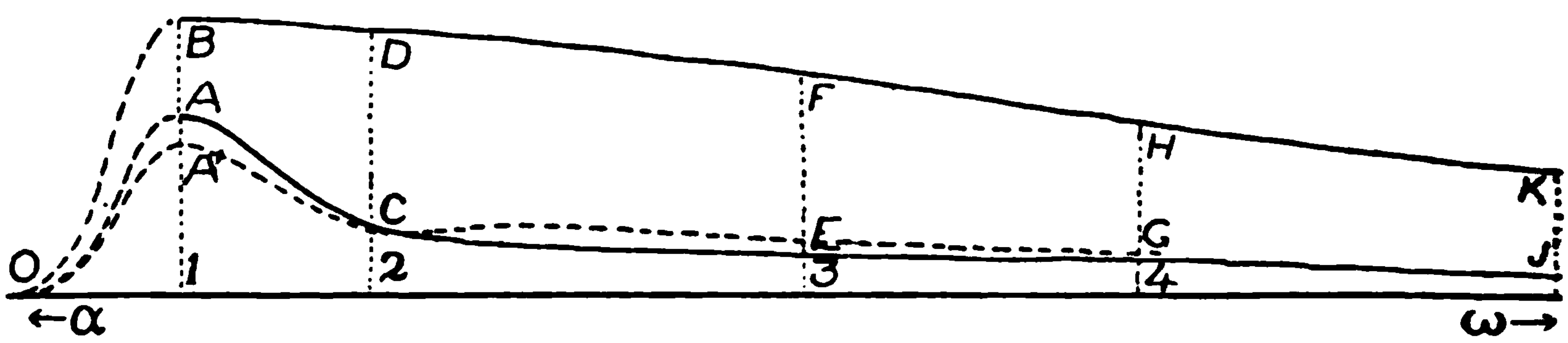


FIG. 1.

thus stands in strong contrast with the period 1–2, when there was the most rapid deepening of the main valleys. In the earlier period, the relief was rapidly increasing in value, as steep-sided valleys were cut beneath the initial troughs. Through the period 2–3 the maximum value of relief is reached, and the variety of form is greatly increased by the headward growth of side valleys. During the period 3–4 relief is decreasing faster than at any other time, and the slope of the valley sides is becoming much gentler than before; but these changes advance much more slowly than those of the first period. From epoch 4 onward the remaining relief is gradually reduced to smaller and smaller measures, and the slopes become fainter and fainter, so that some time after the latest stage of the diagram the region is only a rolling lowland, whatever may have been its original height. So slowly do the later changes advance, that the reduction of the reduced relief JK to half of its value might well require as much time as all that which has already elapsed; and from the gentle slopes that would then remain, the further removal of waste must indeed be exceedingly slow. The frequency of torrential floods and of landslides in young and in mature mountains, in contrast to the quiescence of the sluggish streams and the slow

movement of the soil on lowlands of denudation, suffices to show that rate of denudation is a matter of strictly geographical as well as of geological interest.

It follows from this brief analysis that a geographical cycle may be subdivided into parts of unequal duration, each one of which will be characterized by the strength and variety of relief, and by the rate of change, as well as by the amount of change that has been accomplished since the initiation of the cycle. There will be a brief youth of rapidly increasing relief, a maturity of strongest relief and greatest variety of form, a transition period of most rapidly yet slowly decreasing relief, and an indefinitely long old age of faint relief, on which further changes are exceedingly slow. There are, of course, no breaks between these subdivisions or stages; each one merges into its successor, yet each one is in the main distinctly characterized by features found at no other time.

THE DEVELOPMENT OF CONSEQUENT STREAMS.—The preceding section gives only the barest outline of the systematic sequence of changes that run their course through a geographical cycle. The outline must be at once gone over, in order to fill in the more important details. In the first place, it should not be implied, as was done in Fig. 1, that the forces of uplift or deformation act so rapidly that no destructive changes occur during their operation. A more probable relation at the opening of a cycle of change places the beginning of uplift at O (Fig. 1), and its end at 1. The divergence of the curves OB and OA then implies that certain parts of the disturbed region were uplifted more than others, and that, from a surface of no relief at sea-level at epoch O, an upland having AB relief would be produced at epoch 1. But even during uplift, the streams that gather in the troughs as soon as they are defined do some work, and hence young valleys are already incised in the trough-bottoms when epoch 1 is reached, as shown by the curve OA′. The uplands also waste more or less during the period of disturbance, and hence no absolutely unchanged initial surface should be found, even for some time anterior to epoch 1. Instead of looking for initial divides separating initial slopes that descend to initial troughs followed by initial streams, such as were implied in Fig. 1 at the epoch of instantaneous uplift, we must always expect to find some greater or less advance in the sequence of developmental changes, even in the youngest known land-forms. "Initial" is therefore a term adapted to ideal rather than to actual cases, in treating which the term "sequential" and its derivatives will be found more appropriate. All the changes which directly follow the guidance of the ideal initial forms may be called consequent; thus a young form would possess consequent divides, separating consequent slopes which descend to consequent valleys; the initial troughs being changed to consequent valleys in so far as their form is modified by the action of the consequent drainage.

THE GRADE OF VALLEY FLOORS.—The larger rivers soon—in terms of the cycle—deepen their main valleys, so that their channels are but little above the baselevel of the region; but the valley floor cannot be reduced to the absolute baselevel, because the river must slope down to its mouth at the sea-shore. The altitude of any point on a well-matured valley floor must therefore depend on river-slope and distance from mouth. Distance from mouth may here be treated as a constant, although a fuller statement would consider its increase in consequence of delta-growth. River-slope cannot be less, as engineers know very well, than a certain minimum that is determined by volume and by quantity and texture of detritus or load. Volume may be temporarily taken as a constant, although it may easily be shown to suffer important changes during the progress of a normal cycle. Load is small at the beginning, and rapidly increases in quantity and coarseness during youth, when the region is entrenched by steep-sided valleys; it continues to increase in quantity, but probably not in coarseness, during early maturity, when ramifying valleys are growing by headward erosion, and are thus increasing the area of wasting slopes; but after full maturity, load continually decreases in quantity and in coarseness of texture; and during old age, the small load that is carried must be of very fine texture or else must go off in solution. Let us now consider how the minimum slope of a main river will be determined.

In order to free the problem from unnecessary complications, let it be supposed that the young consequent rivers have at first slopes that are steep enough to make them all more than competent to carry the load that is washed into them from the wasting surface on either side, and hence competent to entrench themselves beneath the floor of the initial troughs,—this being the condition tacitly postulated in Fig. 1, although it evidently departs from those cases in which deformation produces basins where lakes must form and where deposition (negative denudation) must take place, and also from those cases in which a main-trough stream of moderate slope is, even in its youth, over-supplied with detritus by active side streams that descend steep and long wasting surfaces; but all these more involved cases may be set aside for the present.

If a young consequent river be followed from end to end, it may be imagined as everywhere deepening its valley, unless at the very mouth. Valley-deepening will go on most rapidly at some point, probably nearer head than mouth. Above this point the river will find its slope increased; below, decreased. Let the part up-stream from the point of most rapid deepening be called the headwaters; and the part down-stream, the lower course or trunk. In consequence of the changes thus systematically brought about, the lower course of the river will find its slope and velocity decreasing, and its load increasing; that is, its ability to do work is becoming less, while the work that it has to do is becoming

greater. The original excess of ability over work will thus in time be corrected, and when an equality of these two quantities is brought about, the river is *graded*, this being a simple form of expression, suggested by Gilbert, to replace the more cumbersome phrases that are required by the use of "profile of equilibrium" of French engineers. When the graded condition is reached, alteration of slope can take place only as volume and load change their relation; and changes of this kind are very slow.

In a land-mass of homogeneous texture, the graded condition of a river would be (in such cases as are above considered) first attained at the mouth, and would then advance retrogressively up-stream. When the trunk streams are graded, early maturity is reached; when the smaller headwaters and side streams are also graded, maturity is far advanced; and when even the wet-weather rills are graded, old age is attained. In a land-mass of heterogeneous texture, the rivers will be divided into sections by the belts of weaker and stronger rocks that they traverse; each section of weaker rocks will in due time be graded with reference to the section of harder rock next down-stream, and thus the river will come to consist of alternating quiet reaches and hurried falls or rapids. The less resistant of the harder rocks will be slowly worn down to grade with respect to the more resistant ones that are further down stream; thus the rapids will decrease in number, and only those on the very strongest rocks will long survive. Even these must vanish in time, and the graded condition will then be extended from mouth to head. The slope that is adopted when grade is assumed varies inversely with the volume; hence rivers retain steep headwaters long after their lower course is worn down almost level; but in old age, even the head-waters must have a gentle declivity and moderate velocity, free from all torrential features. The so-called "normal river," with torrential head-waters and well-graded middle and lower course, is therefore simply a maturely developed river. A young river may normally have falls even in its lower course, and an old river must be free from rapid movement even near its head.

If an initial consequent stream is for any reason incompetent to carry away the load that is washed into it, it cannot degrade its channel, but must aggrade instead (to use an excellent term suggested by Salisbury). Such a river then lays down the coarser part of the offered load, thus forming a broadening flood-land, building up its valley floor, and steepening its slope until it gains sufficient velocity to do the required work. In this case the graded condition is reached by filling up the initial trough instead of by cutting it down. Where basins occur, consequent lakes rise in them to the level of the outlet at the lowest point of the rim. As the outlet is cut down, it forms a sinking local baselevel with respect to which the basin is aggraded; and as the lake is thus destroyed, it forms a sinking baselevel with respect to which the tributary streams grade their valleys; but, as in

the case of falls and rapids, the local baselevels of outlet and lake are temporary, and lose their control when the main drainage lines are graded with respect to absolute baselevel in early or late maturity.

THE DEVELOPMENT OF RIVER BRANCHES. — Several classes of side streams may be recognized. Some of them are defined by slight initial depressions in the side slopes of the main river-troughs: these form lateral or secondary consequents, branching from a main consequent; they generally run in the direction of the dip of the strata. Others are developed by headward erosion under the guidance of weak sub-structures that have been laid bare on the valley walls of the consequent streams: they follow the strike of the strata, and are entirely regardless of the form of the initial land surface; they may be called subsequent, this term having been used by Jukes in describing the development of such streams. Still others grow here and there, to all appearance by accident, seemingly independent of systematic guidance; they are common in horizontal or massive structures. While waiting to learn just what their control may be, their independence of apparent control may be indicated by calling them "insequent." Additional classes of streams are well known, but cannot be described here for lack of space.

RELATION OF RIVER ABILITY AND LOAD.—As the dissection of a land-mass proceeds with the fuller development of its consequent, subsequent, and insequent streams, the area of steep valley sides greatly increases from youth into early and full maturity. The waste that is delivered by the side branches to the main stream comes chiefly from the valley sides, and hence its quantity increases with the increase of strong dissection, reaching a maximum when the formation of new branch streams ceases, or when the decrease in the slope of the wasting valley sides comes to balance their increase of area. It is interesting to note in this connection the consequences that follow from two contrasted relations of the date for the maximum discharge of waste and of that for the grading of the trunk streams. If the first is not later than the second, the graded rivers will slowly assume gentler slopes as their load lessens; but as the change in the discharge of waste is almost infinitesimal compared to the amount discharged at any one time, the rivers will essentially preserve their graded condition in spite of the minute excess of ability over work. On the other hand, if the maximum of load is not reached until after the first attainment of the graded condition by the trunk rivers, then the valley floors will be aggraded by the deposition of a part of the increasing load, and thus a steeper slope and a greater velocity will be gained whereby the remainder of the increase can be borne along. The bottom of the V-shaped valley, previously carved, is thus slowly filled with a gravelly flood-plain, which continues to rise until the epoch of the maximum load is reached, after which the slow degradation above stated is entered upon. Early maturity may therefore witness a slight shallowing of the main valleys,

instead of the slight deepening (indicated by the dotted line CE in Fig. 1); but late maturity and all old age will be normally occupied by the slow continuation of valley erosion that was so vigorously begun during youth.

THE DEVELOPMENT OF DIVIDES.—There is no more beautiful process to be found in the systematic advance of a geographical cycle than the definition, subdivision, and rearrangement of the divides (water-partings) by which the major and minor drainage basins are separated. The forces of crustal upheaval and deformation act in a much broader way than the processes of land-sculpture; hence at the opening of a cycle one would expect to find a moderate number of large river-basins, somewhat indefinitely separated on the flat crests of broad swells or arches of land surface, or occasionally more sharply limited by the raised edge of faulted blocks. The action of the lateral consequent streams alone would, during youth and early maturity, sharpen all the vague initial divides into well-defined consequent divides, and the further action of insequent and subsequent streams would split up many consequent drainage slopes into subordinate drainage basins, separated by subdivides either insequent or subsequent. Just as the subsequent valleys are eroded by their gnawing streams along weak structural belts, so the subsequent divides or ridges stand up where maintained by strong structural belts. However imperfect the division of drainage areas and the discharge of rainfall may have been in early youth, both are well developed by the time full maturity is reached. Indeed, the more prompt discharge of rainfall that may be expected to result from the development of an elaborate system of subdivides and of slopes from divides to streams should cause an increased percentage of run-off; and it is possible that the increase of river-volume thus brought about from youth to maturity may more or less fully counteract the tendency of increase in river load to cause aggradation. But, on the other hand, as soon as the uplands begin to lose height, the rainfall must decrease; for it is well known that the obstruction to wind-movement caused by highlands is an effective cause of precipitation. While it is a gross exaggeration to maintain that the quaternary Alpine glaciers caused their own destruction by reducing the height of the mountains on which their snows were gathered, it is perfectly logical to deduce a decrease of precipitation as an accompaniment of loss of height from the youth to the old age of a land-mass. Thus many factors must be considered before the life-history of a river can be fully analyzed.

The growth of subsequent streams and drainage areas must be at the expense of the original consequent streams and consequent drainage areas. All changes of this kind are promoted by the occurrence of inclined instead of horizontal rock-layers, and hence are of common occurrence in mountainous regions, but rare in strictly horizontal plains. The changes are also favoured by the occurrence of strong contrasts in the resistance

of adjacent strata. In consequence of the migration of divides thus caused, many streams come to follow valleys that are worn down along belts of weak strata, while the divides come to occupy the ridges that stand up along the belts of stronger strata; in other words, the simple consequent drainage of youth is modified by the development of subsequent drainage lines, so as to bring about an *increasing adjustment of streams to structures*, than which nothing is more characteristic of the mature stage of the geographical cycle. Not only so: adjustments of this kind form one of the strongest, even if one of the latest, proofs of the erosion of valleys by the streams that occupy them, and of the long continued action in the past of the slow processes of weathering and washing that are in operation to-day.

There is nothing more significant of the advance in geographical development than the changes thus brought about. The processes here involved are too complicated to be now presented in detail, but they may be briefly illustrated by taking the drainage of a denuded arch, suggested

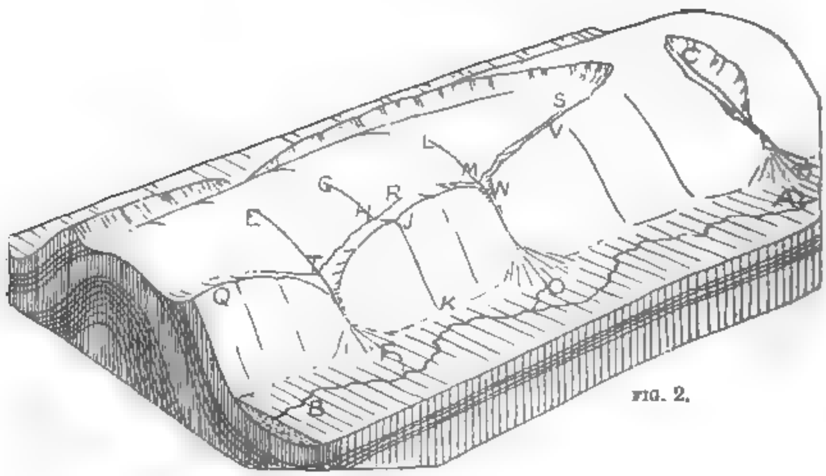


FIG. 2.

by the Jura mountains, as a type example. AB, Fig. 2, is a main longitudinal consequent stream following a trough whose floor has been somewhat aggraded by the waste actively supplied by the lateral consequents, CD, LO, EF, etc. At an earlier stage of denudation, before the hard outer layer was worn away from the crown of the mountain arch all the lateral consequents headed at the line of the mountain crest. But, guided by a weak under-stratum, subsequent streams, TR, MS, have been developed as the branches of certain lateral consequents, EF, LO, and thus the hard outer layer has been undermined and partly removed, and many small lateral consequents have been beheaded. To-day, many of the laterals, like JK, have their source on the crest of the lateral ridge VJQ, and the headwaters, such as GH, that once belonged to them, are now diverted by the subsequent streams to swell the volume of the more

successful laterals, like EF. Similar changes having taken place on the further slope of the mountain arch, we now find the original consequent divide of the arch-crest supplemented by the subsequent divides formed by the lateral ridges. A number of short streams, like JH, belonging to a class not mentioned above, run down the inner face of the lateral ridges to a subsequent stream, RT. These short streams have a direction opposite to that of the original consequents, and may therefore be called obsequents. As denudation progresses, the edge of the lateral ridge will be worn further from the arch-crest; in other words, the subsequent divide will migrate towards the main valley, and thus a greater length will be gained by the diverted consequent headwaters, GH, and a greater volume by the subsequents, SM and RT. During these changes the inequality that must naturally prevail between adjacent successful consequents, EF and LO, will eventually allow the subsequent branch, RT, of the larger consequent, EF, to capture the headwaters, LM and SM, of the smaller consequent, LO. In late maturity the headwaters of so many lateral consequents may be diverted to swell the volume of EF, that the main longitudinal consequent above the point F may be reduced to relatively small volume.

The Development of River Meanders.—It has been thus far implied that rivers cut their channels vertically downward, but this is far from being the whole truth. Every turn in the course of a young consequent stream causes the stronger currents to press toward the outer bank, and each irregular, or, perhaps, subangular bend is thus rounded out to a comparatively smooth curve. The river therefore tends to depart from its irregular initial path (background block of Fig. 3) towards a serpentine course, in which it swings to right and left over a broader belt than at first. As the river cuts downwards and outwards at the same time, the valley-slopes become unsymmetrical (middle block of Fig. 3), being steeper on the side toward which the current is urged by centrifugal force. The steeper valley side thus gains the form of a half-amphitheatre, into which the gentler sloping side enters as a spur of the opposite uplands. When the graded condition is attained by the stream, downward cutting practically ceases, but outward cutting continues; a normal flood-plain is then formed as the channel is withdrawn from the gently sloping side of the valley (foreground block of Fig. 3). Flood-plains of this kind are easily distinguished in their early stages from those already mentioned (formed by aggrading the flat courses of incompetent young rivers, or by aggrading the graded valleys of over-loaded rivers in early maturity); for these occur in detached lunate areas, first on one side, then on the other side of the stream, and always systematically placed at the foot of the gentler sloping spurs. But, as time passes, the river impinges on the up-stream side, and withdraws from the down-stream side of every spur, and thus the spurs are gradually consumed; they are first sharpened, so as better to observe

their name; they are next reduced to short cusps; then they are worn back to blunt salients; and finally, they are entirely consumed, and the river wanders freely on its open flood-plain, occasionally swinging against the valley side, now here, now there. By this time the curves of youth are changed into systematic meanders, of radius appropriate to river volume; and, for all the rest of an undisturbed life, the river persists in the habit of serpentine flow. The less the slope of the flood-plain becomes in advancing old age, the larger the arc of each meander,

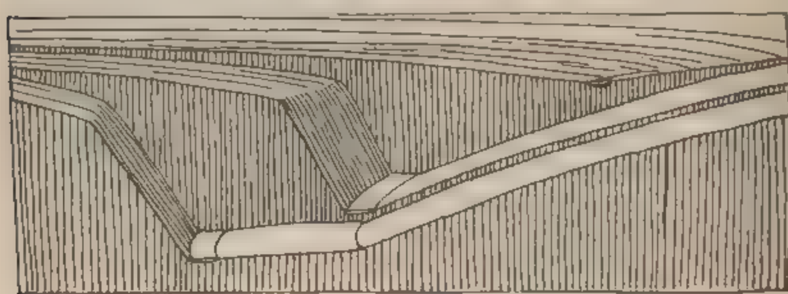


FIG. 3.

and hence the longer the course of the river from any point to its mouth. Increase of length from this cause must tend to diminish fall, and thus to render the river less competent than it was before; and the result of this tendency will be to retard the already slow process by which a gently sloping flood-plain is degraded so as to approach coincidence with a level surface; but it is not likely that old rivers often remain undisturbed long enough for the full realization of these theoretical conditions.

The migration of divides must now and then result in a sudden increase in the volume of one river and in a correspondingly sudden decrease of another. After such changes, accommodation to the changed volume must be made in the meanders of each river affected. The one that is increased will call for enlarged dimensions; it will usually adopt a gentler slope, thus terracing its flood-plain, and demand a greater freedom of swinging, thus widening its valley. The one that is decreased will have to be satisfied with smaller dimensions; it will wander aimlessly in relatively minute meanders on its flood-plain, and from increase of length, as well as from loss of volume, it will become incompetent to transport the load brought in by the side streams, and thus its flood-plain must be aggraded. There are beautiful examples known of both these peculiar conditions.

THE DEVELOPMENT OF GRADED VALLEY SIDES.—When the migration of divides ceases in late maturity, and the valley floors of the adjusted

streams are well graded, even far toward the headwaters, there is still to be completed another and perhaps even more remarkable sequence of systematic changes than any yet described: this is the development of graded waste slopes on the valley sides. It is briefly stated that valleys are eroded by their rivers; yet there is a vast amount of work performed in the erosion of valleys in which rivers have no part. It is true that rivers deepen the valleys in the youth, and widen the valley floors during the maturity and old age of a cycle, and that they carry to the sea the waste denuded from the land; it is this work of transportation to the sea that is peculiarly the function of rivers; but the material to be transported is supplied chiefly by the action of the weather on the steeper consequent slopes and on the valley sides. The transportation of the weathered material from its source to the stream in the valley bottom is the work of various slow-acting processes, such as the surface wash of rain, the action of ground water, changes of temperature, freezing and thawing, chemical disintegration and hydration, the growth of plant-roots, the activities of burrowing animals. All these cause the weathered rock waste to wash and creep slowly downhill, and in the motion thus ensuing there is much that is analogous to the flow of a river. Indeed, when considered in a very broad and general way, a river is seen to be a moving mixture of water and waste in variable proportions, but mostly water; while a creeping sheet of hillside waste is a moving mixture of waste and water in variable proportions, but mostly waste. Although the river and the hillside waste-sheet do not resemble each other at first sight, they are only the extreme members of a continuous series; and when this generalization is appreciated, one may fairly extend the "river" all over its basin, and up to its very divides. Ordinarily treated, the river is like the veins of a leaf; broadly viewed, it is like the entire leaf. The verity of this comparison may be more fully accepted when the analogy, indeed, the homology, of waste-sheets and water-streams is set forth.

In the first place, a waste-sheet moves fastest at the surface and slowest at the bottom, like a water-stream. A graded waste-sheet may be defined in the very terms applicable to a graded water-stream; it is one in which the ability of the transporting forces to do work is equal to the work that they have to do. This is the condition that obtains on those evenly slanting, waste-covered mountain-sides which have been reduced to a slope that engineers call "the angle of repose," because of the apparently stationary condition of the creeping waste, but that should be called, from the physiographic standpoint, "the angle of first-developed grade." The rocky cliffs and ledges that often surmount graded slopes are not yet graded; waste is removed from them faster than it is supplied by local weathering and by creeping from still higher slopes, and hence the cliffs and ledges are left almost bare;

they correspond to falls and rapids in water-streams, where the current is so rapid that its cross-section is much reduced. A hollow on an initial slope will be filled to the angle of grade by waste from above; the waste will accumulate until it reaches the lowest point on the rim of the hollow, and then outflow of waste will balance inflow; and here is the evident homologue of a lake.

In the second place, it will be understood, from what has already been said, that rivers normally grade their valleys retrogressively from the mouth headwards, and that small side streams may not be graded till long after the trunk river is graded. So with waste-sheets; they normally begin to establish a graded condition at their base, and then extend it up the slope of the valley side whose waste they "drain." When rock-masses of various resistance are exposed on the valley side, each one of the weaker is graded with reference to the stronger one next downhill; and the less resistant of the stronger ones are graded with reference to the more resistant (or with reference to the base of the hill): this is perfectly comparable to the development of graded stretches and to the extinction of falls and rapids in rivers. Ledges remain ungraded on ridge-crests and on the convex front of hill spurs long after the graded condition is reached in the channels of wet-weather streams in the ravines between the spurs; this corresponds nicely with the slower attainment of grade in small side streams than in large trunk rivers. But as late maturity passes into old age, even the ledges on ridge-crests and spur-fronts disappear, all being concealed in a universal sheet of slowly creeping waste. From any point on such a surface a graded slope leads the waste down to the streams. At any point the agencies of removal are just able to cope with the waste that is there weathered *plus* that which comes from further uphill. This wonderful condition is reached in certain well-denuded mountains, now subdued from their mature vigour to the rounded profiles of incipient old age. When the full meaning of their graded form is apprehended, it constitutes one of the strongest possible arguments for the sculpture of the lands by the slow processes of weathering, long continued. To look upon a landscape of this kind without any recognition of the labour expended in producing it, or of the extraordinary adjustments of streams to structures, and of waste to weather, is like visiting Rome in the ignorant belief that the Romans of to-day have had no ancestors.

Just as graded rivers slowly degrade their courses after the period of maximum load is past, so graded waste-sheets adopt gentler and gentler slopes when the upper ledges are consumed and coarse waste is no longer plentifully shed to the valley sides below. A changing adjustment of a most delicate kind is here discovered. When the graded slopes are first developed, they are steep, and the waste that covers them is coarse and of moderate thickness; here the strong agencies of removal have all they can do to dispose of the plentiful supply of coarse waste

from the strong ledges above, and the no less plentiful supply of waste that is weathered from the weaker rocks beneath the thin cover of detritus. In a more advanced stage of the cycle, the graded slopes are moderate, and the waste that covers them is of finer texture and greater depth than before; here the weakened agencies of removal are favoured by the slower weathering of the rocks beneath the thickened waste cover, and by the greater refinement (reduction to finer texture) of the loose waste during its slow journey. In old age, when all the slopes are very gentle, the agencies of waste-removal must everywhere be weak, and their equality with the processes of waste-supply can be maintained only by the reduction of the latter to very low values. The waste-sheet then assumes a great thickness—even 50 or 100 feet—so that the progress of weathering is almost *nil*; at the same time, the surface waste is reduced to extremely fine texture, so that some of its particles may be moved even on faint slopes. Hence the occurrence of deep soils is an essential feature of old age, just as the occurrence of bare ledges is of youth. The relationships here obtaining are as significant as those which led Playfair to his famous statement concerning the origin of valleys by the rivers that drain them.

Old Age.—Maturity is past and old age is fully entered upon when the hilltops and the hillsides, as well as the valley floors, are graded. No new features are now developed, and those that have been earlier developed are weakened or even lost. The search for weak structures and the establishment of valleys along them has already been thoroughly carried out; now the larger streams meander freely in open valleys and begin to wander away from the adjustments of maturity. The active streams of the time of greatest relief now lose their headmost branches, for the rainfall is lessened by the destruction of the highlands, and the run-off of the rain water is retarded by the flat slopes and deep soils. The landscape is slowly tamed from its earlier strength, and presents only a succession of gently rolling swells alternating with shallow valleys, a surface everywhere open to occupation. As time passes, the relief becomes less and less; whatever the uplifts of youth, whatever the disorder and hardness of the rocks, an almost featureless plain (a pene-plain) showing little sympathy with structure, and controlled only by a close approach to baselevel, must characterize the penultimate stage of the uninterrupted cycle; and the ultimate stage would be a plain without relief.

Some observers have doubted whether even the penultimate stage of a cycle is ever reached, so frequently do movements in the Earth's crust cause changes in its position with respect to baselevel. But, on the other hand, there are certain regions of greatly disordered structure, whose small relief and deep soils cannot be explained without supposing them to have, in effect, passed through all the stages above described—and doubtless many more, if the whole truth were told—before reaching the

penultimate, whose features they verify. In spite of the great disturbances that such regions have suffered in past geological periods, they have afterwards stood still so long, so patiently, as to be worn down to pene-plains over large areas, only here and there showing residual reliefs where the most resistant rocks still stand up above the general level. Thus verification is found for the penultimate as well as for many earlier stages of the ideal cycle. Indeed, although the scheme of the cycle is here presented only in theoretical form, the progress of developmental changes through the cycle has been tested over and over again for many structures and for various stages; and on recognizing the numerous accordances that are discovered when the consequences of theory are confronted with the facts of observation, one must feel a growing belief in the verity and value of the theory that leads to results so satisfactory.

It is necessary to repeat what has already been said as to the practical application of the principles of the geographical cycle. Its value to the geographer is not simply in giving explanation to land-forms; its greater value is in enabling him to see what he looks at, and to say what he sees. His standards of comparison, by which the unknown are likened to the known, are greatly increased over the short list included in the terminology of his school-days. Significant features are consciously sought for; exploration becomes more systematic and less haphazard. "A hilly region" of the unprepared traveller becomes (if such it really be) "a maturely dissected upland" in the language of the better prepared traveller; and the reader of travels at home gains greatly by the change. "A hilly region" brings no definite picture before the mental eyes. "A maturely dissected upland" suggests a systematic association of well-defined features; all the streams at grade, except the small headwaters; the larger rivers already meandering on flood-plained valley floors; the upper branches ramifying among spurs and hills, whose flanks show a good beginning of graded slopes; the most resistant rocks still cropping out in ungraded ledges, whose arrangement suggests the structure of the region. The practical value of this kind of theoretical study seems to me so great that, among various lines of work that may be encouraged by the Councils of the great Geographical Societies, I believe there is none that would bring larger reward than the encouragement of some such method as is here outlined for the systematic investigation of land-forms.

Some geographers urge that it is dangerous to use the theoretical or explanatory terminology involved in the practical application of the principles of the geographical cycle; mistakes may be made, and harm would thus be done. There are various sufficient answers to this objection. A very practical answer is that suggested by Penck, to the effect that a threefold terminology should be devised—one set of terms being purely empirical, as "high," "low," "cliff," "gorge," "lake," "island;" another set being based on structural relations, as "monoclinal ridge,"

"transverse valley," "lava-capped mesa;" and the third being reserved for explanatory relations, as "mature dissection," "adjusted drainage," "graded slopes." Another answer is that the explanatory terminology is not really a novelty, but only an attempt to give a complete and systematic expansion to a rather timid beginning already made; a sand-dune is not simply a hillock of sand, but a hillock heaped by the wind; a delta is not simply a plain at a river mouth, but a plain formed by river action; a volcano is not simply a mountain of somewhat conical form, but a mountain formed by eruption. It is chiefly a matter of experience and temperament where a geographer ceases to apply terms of this kind. But little more than half a century ago, the erosion of valleys by rivers was either doubted or not thought of by the practical geographer; to-day, the mature adjustment of rivers to structures is in the same position; and here is the third, and to my mind the most important, answer to those conservatives who would maintain an empirical position for geography, instead of pressing forward toward the rational and explanatory geography of the future. It cannot be doubted, in view of what has already been learned to-day, that an essentially explanatory treatment must in the next century be generally adopted in all branches of geographical study; it is full time that an energetic beginning should be made towards so desirable an end.

Interruptions of the Ideal Cycle.—One of the first objections that might be raised against a terminology based on the sequence of changes through the ideal uninterrupted cycle, is that such a terminology can have little practical application on an Earth whose crust has the habit of rising and sinking frequently during the passage of geological time. To this it may be answered, that if the scheme of the geographical cycle were so rigid as to be incapable of accommodating itself to the actual condition of the Earth's crust, it would certainly have to be abandoned as a theoretical abstraction; but such is by no means the case. Having traced the normal sequence of events through an ideal cycle, our next duty is to consider the effects of any and all kinds of movements of the land-mass with respect to its baselevel. Such movements must be imagined as small or great, simple or complex, rare or frequent, gradual or rapid, early or late. Whatever their character, they will be called "interruptions," because they determine a more or less complete break in processes previously in operation, by beginning a new series of processes with respect to the new baselevel. Whenever interruptions occur, the pre-existent conditions that they interrupt can be understood only after having analyzed them in accordance with the principles of the cycle, and herein lies one of the most practical applications of what at first seems remotely theoretical. A land-mass, uplifted to a greater altitude than it had before, is at once more intensely attacked by the denuding processes in the new cycle thus initiated; but the forms on which the new attack is made can only be understood by

considering what had been accomplished in the preceding cycle previous to its interruption. It will be possible here to consider only one or two specific examples from among the multitude of interruptions that may be imagined.

Let it be supposed that a maturely dissected land-mass is evenly uplifted 500 feet above its former position. All the graded streams are hereby revived to new activities, and proceed to entrench their valley floors in order to develop graded courses with respect to the new baselevel. The larger streams first show the effect of the change; the smaller streams follow suit as rapidly as possible. Falls reappear for a time in the river-channels, and then are again worn away. Adjustments of streams to structures are carried further in the second effort of the new cycle than was possible in the single effort of the previous cycle. Graded hillsides are undercut; the waste washes and creeps down from them, leaving a long even slope of bare rock; the rocky slope is hacked into an uneven face by the weather, until at last a new graded slope is developed. Cliffs that had been extinguished on graded hillsides in the previous cycle are thus for a time brought to life again, like the falls in the rivers, only to disappear in the late maturity of the new cycle.

The combination of topographic features belonging to two cycles may be called "composite topography," and many examples could be cited in illustration of this interesting association. In every case, description is made concise and effective by employing a terminology derived from the scheme of the cycle. For example, Normandy is an uplifted peneplain, hardly yet in the mature stage of its new cycle; thus stated, explanation is concisely given to the meandering course of the rather narrow valley of the Seine, for this river has carried forward into the early stages of the new cycle the habit of swinging in strong meanders that it had learned in the later stages of the former cycle.

If the uplift of a dissected region be accompanied by a gentle tilting, then all the water-streams and waste-streams whose slope is increased will be revived to new activity; while all those whose slope is decreased will become less active. The divides will migrate into the basins of the less active streams, and the revived streams will gain length and drainage area. If the uplift be in the form of an arch, some of the weaker streams whose course is across the axis of the arch may be, as it were, "broken in half;" a reversed direction of flow may be thus given to one part of the broken stream; but the stronger rivers may still persevere across the rising arch in spite of its uplift, cutting down their channels fast enough to maintain their direction of flow unchanged; and such rivers are known as "antecedent."

The changes introduced by an interruption involving depression are easily deduced. Among their most interesting features is the invasion of the lower valley floors by the sea, thus "drowning" the valleys to a

certain depth, and converting them into bays. Movements that tend to produce trough-like depressions across the course of a river usually give birth to a lake of water or waste in the depressed part of the river valley. In mountain ranges frequent and various interruptions occur during the long period of deformation; the Alps show so many recent interruptions that a student there would find little use for the ideal cycle; but in mountain regions of ancient deformation, the disturbing forces seem to have become almost extinct, and there the ideal cycle is almost realized. Central France gives good illustration of this principle. It is manifest that one might imagine an endless number of possible combinations among the several factors of structure, stage of development at time of interruption, character of interruption, and time since interruption; but space cannot be here given to their further consideration.

ACCIDENTAL DEPARTURES FROM THE IDEAL CYCLE.—Besides the interruptions that involve movements of a land-mass with respect to baselevel, there are two other classes of departure from the normal or ideal cycle that do not necessarily involve any such movements: these are changes of climate and volcanic eruptions, both of which occur so arbitrarily as to place and time that they may be called "accidents." Changes of climate may vary from the normal towards the frigid or the arid, each change causing significant departures from normal geographical development. If a reverse change of climate brings back more normal conditions, the effects of the abnormal "accident" may last for some small part of a cycle's duration before they are obliterated. It is here that features of glacial origin belong, so common in north-western Europe and north-eastern America. Judging by the present analysis of glacial and interglacial epochs during quaternary time, or of humid and arid epochs in the Great Salt Lake region, it must be concluded that accidental changes may occur over and over again within a single cycle.

In brief illustration of the combined interruptions and accidents, it may be said that southern New England is an old mountain region, which had been reduced to a pretty good peneplain when further denudation was interrupted by a slanting uplift, with gentle descent to the south-east; that in the cycle thus introduced the tilted peneplain was denuded to a sub-mature or late mature stage (according to the strength or weakness of its rocks); and that the maturely dissected region was then glaciated and slightly depressed so recently that little change has happened since. An instructive picture of the region may be conceived from this brief description.

Many volcanic eruptions produce forms so large that they deserve to be treated as new structural regions; but when viewed in a more general way, a great number of eruptions, if not the greater number, produce forms of small dimensions compared to those of the structures on which

they are superposed: the volcanoes of central France are good instances of this relation. Thus considered, volcanoes and lava-flows are so arbitrarily placed in time and space that their classification under the head of "accidents" is warranted. Still further ground for this classification is found when the effects of a volcanic eruption on the pre-existent processes of land-sculpture are examined. A valley may be blockaded by a growing cone and its lava-flows; lakes may form in the up-stream portion of such a valley, even if it be mature or old. If the blockade be low, the lake will overflow to one side of the barrier, and thus the river will be locally displaced from its former course, however well adjusted to a weak structure that course may have been. If the blockade be higher than some points on the headwater divides, the lake will overflow "backwards," and the upper part of the river system will become tributary to an adjacent system. The river must cut a gorge across the divide, however hard the rocks are there; thus systematic adjustments to structure are seriously interfered with, and accidental relations are introduced. The form of the volcanic cone and the sprawling flow of its lava-streams are quite out of accord with the forms that characterize the surrounding region. The cone arbitrarily forms a mountain, even though the subjacent rocks may be weak; the lava-flows aggrade valleys that should be degraded. During the dissection of the cone, a process that is systematic enough if considered for itself alone, a radial arrangement of spurs and ravines will be developed; in long future time the streams of such ravines may cut down through the volcanic structures, and thus superpose themselves most curiously on the underlying structures. The lava-flows, being usually more resistant than the rocks of the district that they invade, gain a local relief as the adjoining surface is lowered by denudation; thus an inversion of topography is brought about, and a "table-mountain" comes to stand where formerly there had been the valley that guided the original course of the lava-flow. The table-mountain may be quite isolated from its volcanic source, where the cone is by this time reduced to a knob or "butte." But although these various considerations seem to me to warrant the classification of volcanic forms as "accidental," in contrast to the systematic forms with which they are usually associated, great importance should not be attached to this method of arrangement; it should be given up as soon as a more truthful or more convenient classification is introduced.

The Forms assumed by Land Waste.—An extension of the subject treated in the section on Graded Valley Sides, would lead to a general discussion of the forms assumed by the waste of the land on the way to the sea; one of the most interesting and profitable topics for investigation that has come under my notice. Geographers are well accustomed to giving due consideration to the forms assumed by the water-drainage of the land on the way to the sea, and a good terminology is already in

use for naming them; but much less consideration is given to the forms assumed by the waste that slowly moves from the land to the sea. They are seldom presented in their true relations; many of them have no generally accepted names—for example, the long slopes of waste that reach forward from the mountains into the desert basins of Persia; forms as common as alluvial fans are unmentioned in all but the most recent school-books; and such features as till plains, moraines, and drumlins are usually given over to the geologist, as if the geographer had nothing to do with them! There can be no question of the great importance of waste-forms to the geographer, but it is not possible here to enter into their consideration. Suffice it to say that waste-forms constitute a geographical group which, like water-forms, stand quite apart from such groups as mountains and plateaus. The latter are forms of structure, and should be classified according to the arrangement of their rocks, and to their age or stage of development. The former are forms of process, and should be classified according to the processes involved, and to the stage that they have reached. The application of this general principle gives much assistance in the description of actual landscapes.

Lack of space prevents due consideration here of the development of shore-lines, a subject not less interesting, suggestive, and helpful than the development of inland forms; but I shall hope to return on some later occasion to a discussion of shore features, when it may be found that much of the terminology already introduced is again applicable. In closing this article, I must revert, if even for a third time, to the practical side of the theoretical cycle, with its interruptions and accidents. It cannot be too carefully borne in mind that the explanation of the origin of land-forms is not for its own sake added to the study of geography, but for the sake of the aid that explanation gives to the observation and description of existing geographical features. The sequence of forms developed through the cycle is not an abstraction that one leaves at home when he goes abroad; it is literally a *vade-mecum* of the most serviceable kind. During the current year that I am spending in Europe, the scheme and the terminology of the cycle have been of the greatest assistance in my studies. Application of both scheme and terminology is found equally well in the minute and infantile coastal plains that border certain stretches of the Scotch shore-line in consequence of the slight post-glacial elevation of the land, and in the broad and aged central plateau of France, where the young valleys of to-day result from the uplift of the region, and the revival of its rivers after they had submaturely dissected a pre-existent peneplain. The adjustments of streams to structures brought about by the interaction of the waxing Severn and the waning Thames, prove to be even more striking than when I first noticed them in 1894.* The large ancient delta of the Var, between

* See *Geographical Journal*, 1895; and *Proceedings Geologists' Association*, 1899.

Nice and Cannes, now uplifted more than 200 metres, and maturely dissected, must come to be the type example of this class of forms. The Italian Riviera, west of Genoa, may be concisely described as a region of subdued mountains that has been partly submerged and that is now approaching maturity of shore-line features in the cycle thus initiated: one may picture, from this brief statement, the mountain spurs with well-graded slopes, limited by a very irregular shore-line when first depressed, but now fronting in a comparatively simple shore-line of cliffed headlands and filled bays. The peninsula of Sorrento, on its northern side, once resembled the Riviera, but it has now been elevated 50 metres, and its uplifted bay-plains have cliffed fronts. The lower Tiber, whose mature valley floor is now somewhat wider than its meander belt, is consequent upon a volcanic accident, for it follows the trough between the slopes of the Bracciano volcanic centre on the north-west, and the Alban centre on the south-east; further up-stream, as far as Orvieto, the river, as a rule, follows a trough between the Apennines and the three volcanic centres of Bolsena, Vico, and Bracciano. The Lepini mountains, a maturely carved block of moderately deformed Cretaceous limestones south of the Alban volcanic group, has along a part of its north-eastern base a very young fault cliff, by which the graded slopes of the spurs and ravines are abruptly cut off; the fault cliff is easily recognized from the train on the line between Rome and Naples.

Botanists and zoologists know very well that a trained observer can easily recognize and describe many small items of form that pass without notice from the untrained observer. It is the same in geography, and the only question is—How can the desired training be secured? Of the many methods of geographical training, I believe that, as far as the forms of the land are concerned, no method can equal the value of one in which explanation is made an essential feature along with observation, for there is no other in which so many mental faculties are exercised.

CONTRIBUTIONS TO THE GEOGRAPHY OF LAKE URMI AND ITS NEIGHBOURHOOD.*

By R. T. GÜNTHER, M.A., Magdalen College, Oxford.

THE following notes are the result of travels in the plateau of Azerbaijan during the summer months of 1898, for the purpose of investigating the fauna and flora of the salt lake of Urmi and of its fresh-water tributaries.

The map of the lake is an attempt to lessen some of the errors of other maps. It is a compromise between my own observations and the best maps to which I have had access. I should like to draw especial attention to the inaccuracies and unsatisfactory discrepancies of all published maps of the district, and to the importance of a more

* Map, p. 592.

accurate survey of the lake and its islands. When the limits of the lake, both in its season of high and of low water, have been mapped with precision, the physical geographer will be in a better position to realize and to explain the extraordinary changes of level which the lake, like so many other salt lakes, has exhibited in recent years. He will then be enabled to state with more confidence, than at present, whether the recent flooding of the western littoral is due to a movement of the crust of the Earth, more gradual than those which destroyed Tabriz, or merely to an increase of rainfall as compared with evaporation.

I am glad to take this opportunity of acknowledging my indebtedness to the Government Grant Committee of the Royal Society for pecuniary assistance, as well as to the Royal Geographical Society for the loan of instruments. I am also under deep personal obligations to the members of the Archbishop of Canterbury's Assyrian Mission and to H.M. Consul-General, Mr. Cecil Wood, for their unfailing courtesy and hospitality at Urmi and at Tabriz. For my personal safety and for the loan of one of the ships on the lake, I am greatly indebted to the Amir Nizam.

The name Urmi, or Urmia, appears under a variety of synonyms in maps and literature. Urmi is the form adopted by the Archbishop's Mission and by Kiepert, and is the local name for the town. The variations Urumia, Urumea, Urumiyeh, Ooroomieyah, Urumiyah have their origin in foreign mispronunciations or in false etymological derivations, and never seem to have been indigenous. In Persia, except from the lips of certain members of the American Mission, I never heard any other pronunciation than Urmi. The lake is known as the Urmi-gjölü on the western side, but Shah-gjölü in Tabriz (Kiepert), and appears to be the Σπαύτα of Strabo.

Hydrography.—The Urmi lake-basin is situated upon a plateau of over 4000 feet above sea-level, which is the water-parting between the rivers flowing into the Caspian sea and those flowing into the Persian gulf, or between the Arctic * and the Indian oceans. On this plateau is a depression which Sir Oliver St. John estimated as extending over an area of 20,000 square miles. I have redetermined it at 19,370 square miles, of which 1795 square miles are at present occupied by the Lake of Urmi and its islands.

The level of the lake is about 4100 feet (4025, Schindler) above sea-level; about 4184 feet, or 84 feet more, above the level of the Caspian; and about 1114 feet lower than Lake Van (5214 feet). Its depth is insignificant as compared with its area, and probably does not

* The Caspian sea is regarded as belonging to the Arctic water system. The fauna of the Caspian sea affords indications, zoologically very convincing, of a not very remote connection of its waters with those of the Arctic ocean.

exceed 50 feet. Over the water-partings the lowest passes vary from about 5700 feet to 9000 feet on the west, while several mountains rise to a height of over 10,000 feet (Savalan, 15,792; Sahend, 11,630). The Kurdish mountains to the west retain their winter's snow until after midsummer.

One of the most interesting of the phenomena exhibited by Lake Urmi is the hitherto unaccountable rise and fall of the level of its waters. Like so many desert lakes which have no overflow, and unlike lakes in temperate zones, the size of Lake Urmi is not only continually changing with the season of the year, but is also subject to fluctuations occurring in longer and less regular cycles, to the great annoyance of the dwellers on its littoral. An expedition of Italian investigators visited the lake during the winter of 1897,* and doubtless their report, when published, will show how insufficient the data of the local meteorology are for the elucidation of the problem.

The only continuous observations on the rainfall of the district to which I have had access were made as long ago as 1853–54, and are quoted by Supan in his excellent compilation of rainfall statistics published in the Ergänzungsheft, No. 124, of *Petermanns Mitteilungen* for 1898. The rainfall for that year was 547 millimetres, or about 22 inches, of which less than 40 millimetres fell during June, July, August, and September. It is highly improbable that that figure represents the average rainfall for the entire Urmi basin That portion of the rain-water which falls upon the 19,370 square miles of the Urmi basin, and which finally finds its way into the lake, is really a small proportion of the entire rainfall, because a large proportion is lost by evaporation from the plains which surround the lake. The torrents from the mountains soon unite in common channels; but their waters are often redistributed among irrigation canals, and are thus dispersed over a wide expanse of fertile plain. Consequently, but little water reaches the lake when summer irrigation is in progress.

Rivers.—The river systems which discharge into Lake Urmi are naturally divisible into four groups.

To the first group belong the rivers which receive the drainage from the mountains to the west. The Zola Chai, or Salmas Chai, waters the plain of Salmas; the plain of Urmi is watered by the Nazlu, Shaher (or Nah ad medita), and Barenduz.

The several tributaries of the Nazlu Chai rise among the mountains of Tergawar within the Persian territory, and on reaching the plain of Urmi unite into a single stream which falls into the lake quite near Superghan. Like many of these mountain streams, the Nazlu Chai is occasionally liable to serious floods, owing to landslips blocking the river and damming up a head of water, which sooner or later bursts

* *Bolletino della Società Geographica Italiana*. x pp 459, 460 1897

through the obstruction with overwhelming violence. Such a catastrophe happened in May, 1896. Great tracts of the plain along the entire course of the river were flooded, huge trees were torn up, vineyards wrecked, and even entire villages were destroyed. The middle piers and arches of the very fine and substantial brick bridge of Chankaralui, on the road from Urmi to Gavilan, were carried off.

All of these rivers contain an abundance of chub, roach, and *Capoeta*, but none of them contain the *Silurus glanis*, which is found in the Gader Chai which, although entering the lake from the southern end, takes its

MAIN STREET, ARDISHAI.
(From a photograph by E. H. Heazell, Esq.)

source in the same range of mountains as the other members of the group. The entire area drained by these rivers is about 4313 square miles.

To the second and southern group belong the two large rivers, the Tatawa Chai with its Sujbulak tributary, and the Djaghatu Chai, which together drain an area of 6323 square miles. The mouths of these rivers are hard to define, since they change with the seasonal redistributions of land and water. What is dry, sun-cracked grassland with an abundance of sea-lavender and a yellow mullein (Bishop) in summer, becomes an impassable marsh after the winter. These rivers contain great quantities of *Silurus glanis*, which grow to the considerable length of 5 feet.

The third group includes the many small channels which seam the

sides of the trachytic Mount Sahend and the valley of the Adji Chai, which, rising in the Savalan, waters the valley in which Tabriz is situated. When much water is coming down the Adji Chai, and when the lake-level is high, the plain near the mouth of the Adji Chai becomes a swamp, and the Shahi becomes an island.

The fourth group drains the narrow strip of land to the north of the lake. There is only one stream of any considerable size, viz. the Salian Rud; the other drainage channels are insignificant.

The relative importance of these various streams, as shown by the approximate area drained by each, is set forth in the accompanying table—

TABLE OF AREAS DRAINED BY THE RIVERS FLOWING INTO LAKE URMI

	Drainage areas, 100 sq. miles
I.	
Zola Chai	11·7
Nazlu Chai	9·0
Shaber Chai	2·6
Barenduz Chai	5·4
Guder Chai ...	7·4
Other drainage areas .	7·0
Total	43·1
II.	
Tatawa Chai	21·3
Djaghatu Chai	41·9
Total	63·2
III.	
Murdi Chai	4·1
Safi Chai	3·6
Slopes of Sahend .	9·5
Adji Chai	38·9
Slopes of Shahi ..	2·8
Total	58·9

	Drainage areas, 100 sq. miles.
IV.	
Salian Rud .. .	5·8
Other drainage areas .	4·8
Total	10·6
SUMMARY.	
Area I.	43·1
„ II. . .	63·2
„ III.	58·9
„ IV.	10·6
„ of lake	17·9
Total area of Urmi basin ...	193·7

Springs.—In addition to the water of the rivers, Lake Urmi receives the water of many springs. St. George's spring below the hill at Superghan, the springs at Daschkiesen, and the spring on the island of Koyun Daghi, discharge their waters almost directly into the lake. Other springs are said to rise in the bed of the lake itself near Solduz, and have been accused by the natives of having caused the recent rise in the level of the water.

The Lake of Urmi itself extends over an area of about 1795 square miles at times of low water, and probably covers 600 square miles more in wet years when the spring thaws have melted the snow on the

plains. It measures about 80 miles from north to south, and 24 from east to west. It is a very shallow lake; the greatest depth does not exceed some 45 or 50 feet, and the average depth is far less, probably not more than 20 feet. Its shores for the most part are of a very gentle gradient; but at certain places, hills of Miocene limestone rock or of volcanic origin rise up abruptly from the usually flat shores. In the middle of the southern half of the lake is a group of islands, composed for the most part of Miocene calcareous rocks, but undoubted Palæozoic strata appear beneath them.

The analysis of the water of Lake Urmi * shows that it is about three-fifths as salt as the water of the Dead sea, and that it is still far from

SUNNITE TOWER, SALMAS.
(*From a photograph by F. H. Heasell, Esq.*)

being saturated. It is, however, far too salt to permit the existence of fish life, and therefore it must act as a very efficient barrier between otherwise disconnected fresh-water rivers, and be an absolute obstacle to migration. The only organisms at present living in the lake are a species of Artemia, a crustacean known from other brine lakes in Europe and North America, the larva of a species of dipterous insect, probably allied to Ephydra, and green vegetable masses composed of bacterial zooglœæ covered with a species of diatom.

The temperature of the salt-lake waters remained tolerably constant during the month of August. The extremes recorded were 82° Fahr. on August 2, and 78·5° Fahr. on the 24th. On both occasions there was a stiffish breeze, from the south-west on the 2nd, when the air-temperature

* For details see *Proc. R. S.*, vol. 65, p. 312.

was 89° Fahr.; but from the south-east on the 24th, with an air temperature of 80° Fahr. On August 23 and 25 the temperatures of the surface water were 80° and 79° Fahr. respectively at sunrise, while the bottom water (*circ.* 3 to 4 fathoms) was at a temperature of 77° Fahr. on both occasions. It would be most interesting to have the winter temperatures recorded as well.

The water has a very painful action on the mucous membranes of the eyes, nose, and mouth, but otherwise I did not experience any of the unpleasant effects which are usually attributed to such strongly saline waters.* I always found bathing pleasant on account of the great buoyancy of the water, and did not find that the buoyancy was at all incompatible with swimming, as has often been stated. Bathing is invigorating if care be taken to avoid exposure to the strong rays of the sun. A man with a sun-tanned back can bathe with impunity, when another whose spinal cord is unprotected by pigment would run great risk of sunstroke. On emerging, if the water be not quickly removed by a towel, the skin becomes covered with a thin white film of salt.

Margin of Lake.—The fertile plain of Urmi descends so gradually to the margin of the lake, and then sinks below its surface with so imperceptible an incline, that a rise or fall of but a few inches in the level of the lake is sufficient to flood or leave dry many acres of land. The inhabitants of the villages near the lake, both in the plain of Salmas and in that of Urmi, are complaining of a rise within the last couple of years. The water has risen in the *tanuras*, or underground ovens for baking bread, in some of the houses, and has submerged many acres of arable land. A rather unpleasant experience helped both Mr. Irving and myself to realize the present state of the margin of the lake. Contrary winds compelled us to land from our ship of about 4-foot draught near Ardishai. We had to wade through gradually shoaling water for about a mile. Although the land must have been submerged for some time, yet the ditches of former fields, and even their ridges and furrows, were painfully well preserved. As the water became shallower it also became hotter, and every footstep disengaged volumes of sulphuretted hydrogen from the stinking black mud. Nearer *terra firma* still, the shallow layer of water gave way to a brilliant white crust of crystalline salt covering the same sickening black mud, heated almost to scalding point by the sun. Although I spent many nights on or near the shores of the lake, I was never fortunate enough to witness the curious, and I should say extremely rare, phenomenon recorded by Dr. Wills at the north end of the lake near Turseh. On the evening of April 4, 18—, "many bituminous fires

* Cp. Strabo, bk. xi., 'Media:' "Lacum habet, qui Spauta dicitur in quo sales efflorescentes coguntur; ii pruritum doloresque excitant; oleum malo ei medetur, et aqua dulcis sanat sic inflammatas vestes, si quis ignarus lavandi causa eo immerserit" (Th. Falconer's translation, 1807).

lighted it up at night, huge sheets of flame suddenly appearing." None of my questions on the spot elicited any information on the subject. There is no doubt that the chemical changes which take place in the objectionable black mud are responsible for the formation of large quantities of sulphuretted hydrogen and probably also of marsh-gas, but whether they have any part in what seems to be a will-o'-the-wisp phenomenon on a gigantic scale is not proven. I never heard of any petroleum springs near Lake Urmi.

The flatness of the shore of the plain of Urmi is interrupted at two points. At about 2 miles south-east of Superghan a conical hill (St. George's hill) rises up suddenly on the margin of the lake, and at its foot, within a few yards of the lake, are several fresh-water springs, of which the largest is also called after St. George, the patron saint of Superghan, and is much in repute in cases of leprosy. On July 22 the temperature of its waters was 67° Fahr., while that of the lake-water was 80° Fahr.

The road from Urmi to Superghan passes by another isolated hill called Bakchikala, which is chiefly interesting on account of the tradition which associates its ruins with the native city of Zoroaster. The road is carried across some marshy ground by a causeway which leads towards the lake.

Further south the dead level of the shore is again broken by the picturesque Bezau Daghi (= Cow mountains), which are, at all events, partly volcanic (Appendix, 1, *a–d*), but which Loftus described as blue schist and ironstone. The highest

PANORAMIC VIEW OF PLAIN OF URMI.
(*From photograph taken by Athelstan Riley, Esq.*)

of its three chief peaks must be at least 800 feet above the little port of Gulmachana, where the quickly shelving beach and tufa rocks allow the boats to moor close inshore.

The fleet at present on Lake Urmi consists of three ships of about 20 tons burden, round bottomed, round bowed, but with flat sterns and a great capability of rolling. An enormous square sail, strengthened by diagonal horsehair tapes, is hung symmetrically from a yard on the mast stepped far forward. Each ship has a huge iron anchor at its bows, which plays an important part in the navigation. The ships can only sail before the wind, and consequently, when the wind shifts into an unfavourable quarter, which happens once or twice every day, the anchor is dropped until the wind becomes favourable once more.

We had a crew of seven Mussulmans, who told me that they and all those "who understand the art of walking upon the waters" come from the same village—Giamitshi, on the shores of the lake not far north of Ardishai. The sole right of navigation is vested in the Admiral of the Fleet, the Shahzada, governor of Maragha. The ship placed at my disposal by the agent, by command of the Amir Nizam, was called the *Nahangk* (= leopard). It was completely decked over, and smelt of sheep.

Islands.—In the southern half of the lake is a small group of rocky islands of ill-defined geographical position, but undoubtedly situated nearer the eastern than the western shore of the lake, and not *vice versâ* (Russian map). Some eight or nine of the islands in this archipelago have received names, but there are many small islets and upstanding rocks which have not been mapped, and are a source of anxiety to the navigator. From a distance they present a rounded appearance, like the knolls on our chalk downs, but from a near point of view their precipitous cliffs and rugged hillsides testify to the erosive powers of the heavy salt waves in stormy weather. Here and there are beaches of true marine shells, coral fragments, and echinoderms, such as could only have lived in a real sea of marine salinity and in connection with the ocean. These marine shells, now for a second time rolled by salt waves, tell the tale of a Miocene sea of normal salinity, which has been stated to have been a northerly continuation of the Persian gulf from the Indian ocean, but was almost certainly a part of the vast Miocene Mediterranean. This Miocene sea seems to have had a climate like that of the present Red sea, and, like it, was a coral sea. Upon its floor were laid down the chalk and limestone formations of the Urmi archipelago, as well as those of the calcareous mountains on the south of the lake, and which, so far as their fossils go, are very like the Miocene of the Vienna basin.

There is a tradition that the islands were connected with the mainland some eighty years ago by dry land, and that they were then inhabited. The captain of one of the ships assured me that there was

a submerged ridge of land extending in a south-westerly direction from the islands, but I had not time to make any soundings myself in verification of his statement. It is certain, however, that Koyun Daghi was formerly inhabited, because ruins and foundations of several houses may be traced near the spring. At the present time the islands are uninhabited, but they are often visited by the sailors, who turn out goats and sheep to pasture during certain months in the year, and who dig up for fuel the roots of trees cut down by their predecessors. At a distance from the landing-places of the sailors, a few walnut trees may still be found on Koyun Daghi.

The zoology of the islands, to my mind, affords conclusive testimony of their having been connected with the mainland at no very distant date. I found many species of animals living upon them which would have been very unlikely to have crossed 10 miles of fresh water, and which certainly could not have crossed 10 miles of Lake Urmi water.

On Koyun Daghi at least five species of land shells and two species of lizards (*Eremia* and *Eumeces*), as well as wood-lice, scorpions, and wingless insects. I was fortunate, also, to discover the skeleton of an undoubtedly wild sheep allied to *Ovis ophion*. Not realizing the importance of the discovery at the time, I only picked up its skull, and left the rest of the skeleton behind. It is possible that this sheep, too, may belong to a "Relikten-fauna"—if I may be permitted to apply Credner's name to a terrestrial fauna—and that its ancestors were cut off from the mainland when the isthmus became submerged.

Koyun Daghi, the largest of the islands, measures between 3 and 4 miles from end to end, from west-north-west to east-south-east. On the north-east its magnificent calcareous cliffs rise nearly vertically from the waters, which are slowly mining their foundations. Near the northern end is a small bay opposite Arzu, which affords excellent shelter, but there is no water near, and therefore the sailors always endeavour to make the cove at the other end of the island. Here we pitched our tent in an amphitheatre of steep hills on an arena overgrown with Artemisia bushes and with a few surviving walnut trees, which pay for their immunity from the Mussulman axe by yielding shade to his midday slumbers.

The view eastwards was always charming, but it was especially so when, towards the end of the afternoon, the lengthening rays of the sun setting behind the spectator illumined the chalk-white cliffs of Jewitt Daghi and Kizil Kugur, and the two tooth-like rocks between them. The white islands seemed to float like two guard-ships at anchor on the still blue of the salt lake. As the rays slant more and more, the red stratified cliffs of the farther shore, and beyond them the fainter irregular Sahend mountains, exhibit in turn the entire sunset spectrum of yellows, reds, and rosy purples against a cloudless sky. In the foreground enframing all is the white beach of coral and shell pebbles,

VIEW OF LAKE URMI FROM SPRING ON KOYUN DAGHI.

flanked by the hills at the horns of the bay, dotted with dark-green artemisia bushes.

Near our encampment was a spring of excellent fresh water, clear and cool, from the limestone hills. Its flow had shrunk to about a quart per minute owing to the drought, but it is said never to fail entirely. The overflow from the spring runs into a tiny marsh, which preserves its verdure all through the summer, and affords a grateful rendezvous to the crowds of thirsty birds which congregate at certain hours of the day. At the southern end of the beach is a small natural lagoon or salt-pan, which has been separated from the lake by the upheaval of a bar of shingle of about 30 feet in width. The lake-water percolates through the bar and becomes concentrated by evaporation in the lagoon. The specific gravity of the water in the lake was 1·113, whereas that of the water in the lagoon was 1·20; a white crust of salt outlined the margin.

Arzu is one of the larger islands in the archipelago. Its cliff-girt rounded hills rise to about half the altitude of those of Koyun Daghi. Their vegetation was much the same as that of the other islands—burnt-up grass dotted over with dark-green artemisia bushes and a few stunted walnut trees. There is said to be no water on the island. A hill at the south-west end is connected

with the rest of the island by a narrow beach, which was submerged to a depth of 2 to 3 inches in August, 1898. I was informed that but a year previously it was possible to cross dryshod. We have, therefore, further evidence of the recent rise of level of the waters.

Shazalan Island and Shazalan Hills.—These form a small group of islets, situated to the north of Arzu, which do not appear to be satisfactorily shown in the maps. The largest, Shazalan island, is about 500 yards long and about half as wide. Its greatest elevation near the southern end cannot be much more than 50 feet above the level of the lake. It is grass-grown, and supports many small bushes of the "kharauan" plant (*Artemisia*), as well as pigeons and lizards.

The Shazalan hills are of similar character to the east of Shazalan island, but separated from it by a channel of about 4 fathoms in depth. The cliffs of all indicate marine erosion for a very considerable period.

Ispir lies off the west end of Koyun Daghi. Its lower limestone hills do not rise above about 300 feet, and were yellow with dried grass when I saw them. The island seems to be about 1 mile long. Abich maintains that the same two geological divisions as on Koyun, may be distinguished in its rocks.

Ishak lies to the south of Koyun Daghi. I was not able to visit it, but believe it to be low and smaller than is shown on the maps.

Kizil Kugur and Jewitt Daghi have already been mentioned. They seem to have been formerly connected by a ridge of rock which has since been washed away, with the exception of two small rocks which stick up out of the water like teeth between the islands.

Khar and the Jairli islands are shown on the Russian map. They are all quite small, and I was not able to visit them.

Notes on Route from the Eastern Shore of Lake to Tabriz, and to Urmi round the Southern End of the Lake.—The best landing-places on the eastern shore of the lake are either on the rocky spurs of Mount Shahi, or at the foot of the hills to the south of Khanaga. The latter is generally the best, because the traveller who has disembarked on Mount Shahi may find himself cut off from the mainland by the swamp which exists during many months of the year. I landed at Yaram yatach in an excellent little cove open to the south, but sheltered on the west by a promontory of trachytic rock with quartz veins and nodules.

After the usual delay, horses were produced by the chief man of the village of Ramanlui, and we were able to proceed to Tabriz by a route very similar to that about to be described in the reverse direction.

Tabriz, the commercial capital of Persia where "merchants make large profits" (Marco Polo), has been described so often that I will confine myself to recording two scandals of but, I hope, transitory nature. When we arrived at Tabriz on August 28, we were unable to obtain any bread except at the most exorbitant prices. There was no lack of wheat in the country—indeed, the harvest was of the most fruitful; yet, owing

to the corruption of the Government, there was a famine in the city. Every day the starving multitudes of Tabrizlis might be seen fighting for the few loaves round the bakers' shops in the bazaar. It seems that certain persons, said to be friends of the governor, had bought up all the wheat, had made a "corner" in it, and refused to sell except at famine prices. Fortunately, I was soon relieved of all unpleasant reflections on the subject by the kindest of hosts, Mr. Cecil Wood, H.M. Consul-General at Tabriz.

A far more lamentable matter than the speculation in corn is that one of the finest works of art in Asia, the magnificent Blue Mosque, is not better cared for. Originally a Sunnite temple, it was put to the most degrading uses by the Shiites; and its superb walls are being continually stripped of their priceless tile work by ignorant and ruthless hands. A few years ago the entrance to the interior was boarded up, and a wall was thrown round the fabric; but although by such means some would-be sacrilegious spoilers may be kept at a distance, yet others are the better screened from observation.

On September 1 I reluctantly left Mr. Wood's hospitable roof, and soon joined the great track to Maragha, which skirts the western slopes of Mount Sahend and its outliers at such an elevation as to be well above the low land liable to floods. At some 9 miles from Tabriz, the stony road, after traversing a small ridge of gravel conglomerate hills, descends to the village of Sardarud, with its long bazaar of greengrocers' and saddlers' stalls. Then follows a wearisome plain for another 10 miles. At Irindji, the gravel hills to the east exhibit a very conspicuous horizontal stratum of a hard sandstone lying near their summits.

Owing to the season of the year, I was able to continue my march to Gogan by a short cut across a flat mud plain overgrown with coarse grass. When I rode over it, its sun-cracked surface was hard enough, but in spring it is a swamp. At such times the Shahi peninsula becomes an island. In former years, tradition asserts that the level of the lake was higher, and that the Shahi was an island all the year round, so that, in 1265, when Hulagu was buried on Mount Shahi, the dulness of its island solitude was mitigated by the simultaneous interment of one of his wives. More convincing testimony concerning the former height of the waters of the lake is afforded us by marks of erosion on the hills near Ilghichi (Houtum-Schindler), and by the fact that, whereas the main caravan route from Tabriz to Maragha formerly passed through Dekhargan, now it passes through Gogan, a large town lower down the same valley.

In the village of Dekhargan is an enormous plane tree of great age, shading three curious Moslem tombstones representing animals. In the Urmi basin large trees are extremely rare, and are generally regarded as holy trees. In Persia holy trees are often planes; one in the vicinity of Shiraz is referred to by Chardin as being overhung with

Royal Geographical Society.

NATURE AND OBJECTS.

THE ROYAL GEOGRAPHICAL SOCIETY was founded in 1830 for the Advancement of Geographical Science. It received a Royal Charter of Incorporation in 1859.

The Society's affairs are managed through a Council consisting of a President, Vice-Presidents, Treasurer, Trustees, Secretaries and twenty-one other Fellows, elected annually at a General Meeting of the Fellows.

The Society carries out the object for which it exists—

(1) By holding Meetings at regular intervals during the Session (November to June), at which communications are made and discussed by travellers, explorers and geographers, dealing with new discoveries, and with other matters pertaining to the field of geography.

(2) By the publication monthly of the *Geographical Journal*, in which are contained not only the communications made directly to the Society, but articles, notes and correspondence relating to geography and travel all over the world, and also a bibliography of all books, papers and articles dealing with geography published during the month, and lists of all the most important maps issued. The *Journal* is amply supplied with new maps and illustrations. It is sent free to all Fellows.

(3) By the issue of other occasional publications and maps.

(4) By the maintenance of a Library and a Collection of Maps and Photographs. The Library numbers 50,000 volumes; there are 95,000 maps and 10,000 photographs. The Library and Map Room are open to all Fellows, and there is ample accommodation in the Society's House for reading and research. Each Fellow is entitled to borrow four volumes at a time.

(5) By the assistance rendered by the staff to those in search of geographical information.

(6) By carrying on a system of instruction for intending travellers in various branches connected with geography.

(7) By contributing to the expenses of exploring expeditions, and by lending instruments to travellers who are competent to use them.

(8) By encouraging, directly and indirectly, the improvement of geographical education.

(9) By the award annually of medals and other honours to distinguished travellers and geographers.

Her Majesty the Queen is Patron of the Society, H.R.H. the Prince of Wales Vice-Patron, and T.R.H. the Duke of Saxe-Coburg-Gotha and the Duke of York Honorary Presidents.

The President of the Society (1899–1900) is Sir Clements Markham, K.C.B., F.R.S.

Candidates for admission into the Society must be proposed and seconded by Fellows, and it is necessary that the description and residence of such Candidates should be clearly stated on their Certificates.

It is provided by Chapter IV., § 1, of the Regulations, that,

"Every Ordinary Fellow shall, on his election, be required to pay £5 as his "admission fee, and £2 as his first annual subscription, or he may compound either "at his entrance by one payment of £35, or at any subsequent period on the following "basis:—

Fellows of 20 years' standing and over	.. .. ..	£12 10s.
" 15 " " and under 20	.. .. ..	£16
" 10 " " " 15	.. .. ..	£20

"And no Fellow shall be entitled to vote or to enjoy any other privilege of the "Society so long as he shall continue in arrear."

All Subscriptions are payable in advance, on the 1st of January in each year.

Copies of the Regulations and Candidates' Certificates may be had on application at the Society's House, 1 Savile Row, London, W.

The Society's House is open from 10·30 A.M. to 5 P.M.; on Saturdays to 1 P.M.; and on Meeting nights to 8·15 P.M.

On the Ground Floor of the House are the Offices and Map Room.

On the First Floor the main Library and the Council Room, which is available to Fellows as a reading room when not required for Council or Committee Meetings.

On the Second Floor are the Secretary's Office, the upper Library (fitted up specially for the use of Students), and the Librarian's Room.

On the Third Floor is another portion of the Library, a Smoking Room, a Room for Instruction, the Map Draughtsman's Department, and the Map Mounter's Work Room.

On the Roof is the Observatory.

Full details with regard to the Society, with List of Fellows, &c., are given in THE YEAR BOOK, copies of which may be obtained on application.

SESSION 1899-1900.

PROVISIONAL PROGRAMME.

Ordinary Meetings.

The following are the dates at which the Ordinary Meetings of the Society will be held, at 8.30 P.M., in the Theatre of the University of London, Burlington Gardens (by permission of the Senate):—

1899.	Monday,	November	13, 27	1900.	Monday,	April	2, 30
	„	December	11		„	May	14
1900.	„	January	22		„	„ *Anniversary*	21*
	„	February	5, 19				
	„	March	5, 19		„	June	18, 25

* The Anniversary Meeting will be held at 3 p.m., in the Map Room.

So far the following arrangements have been made:—

November 13.—Introductory Address by the PRESIDENT. Travels in Bokhara. By WILLY RICKMER RICKMERS.

November 27.—Desert Sand Dunes. By VAUGHAN CORNISH.

Other Papers which may be expected are the following:—

Twelve Years' Work of the Ordnance Survey. By Colonel Sir JOHN FARQUHARSON, K.C.B., R.E.

An Ascent of Mount Kenya. By H. J. MACKINDER.

Anthropogeography of British New Guinea. By Professor HADDON, F.R.S.

Travels in the Region of Lake Rudolf and the Sobat River. By Capt. WELLBY.

The Work of the *Yermak* Ice-breaker. By Admiral MAKAROFF.

Travels in Central Asia. By Capt. H. H. P. DEASY.

Travels in Abyssinia. By H. WELD BLUNDELL.

N.B.—Information as to the Society's Meetings, and other matters of interest to Fellows, is given under the head of Notices, on p. iv of the monthly parts of the *Geographical Journal.*

Extra Meetings. When considered necessary by the President and Council Extra Meetings will be held, and will be announced in the usual way in the *Journal*.

Afternoon Meetings. Special Afternoon Meetings will be held in the Map Room; of these due notice will be given.

Anniversary Dinner and Conversazione. The Anniversary Dinner of the Society will take place on the evening of May 21st, 1900. The date of the Annual Conversazione will be announced in due course.

Instructions for Intending Travellers. Details as to the Society's arrangements for instruction to intending travellers can be obtained by applying to the Secretary.

LEONARD DARWIN, } *Honorary*
JAMES F. HUGHES, } *Secretaries.*
J. SCOTT KELTIE, *Secretary.*

1 Savile Row, London, W.
November 1899.

amulets and rags. The Rev. S. J. Daltry records another near the sulphur springs on the hills north of Gavilan.

Beyond Gogan the track crosses some rough limestone hills, which hide the lake completely; to the east rises a group of remarkable basaltic hills, whose abruptly truncated summits are conspicuous for miles around. The well-known Maragha marble is quarried at Daschkiesen, on the south-west slopes of the calcareous hills. The quarries lie to the west of the road as it descends to an iris-covered plain, separating the calcareous hills from a ridge of slate hills, which reach from Khanaga southwards as far as Adjebshir and Khanian. The slate rocks underlie the Maragha marble limestones.

In Maragha the marble has been very extensively employed for building purposes, and both in the town and in the adjacent villages large slabs have been erected for use as public castor-oil crushing tables. The magnificent carved slabs of this material in the Blue Mosque at Tabriz have been admired by all travellers, and Lord Curzon of Kedleston has recognized slabs of the same handsome material as far away as Samarkand. It is deposited from spring water in the form of horizontal layers, which may reach a thickness of 7 to 8 inches. The temperature of the springs was 69° Fahr. in September.

An analysis of the Maragha Onyx marble was made by Mr. R. L. Packard, with the following results:—

$CaCO_3$	90·93
$MgCO_3$	0·75
$FeCO_3$	1·37
$MnCO_3$	4·34
$CaSO_4$	2·30
$Ca_3(PO_4)_2$	0·24
	99 93

It thus appears to be remarkable, as compared with other travertines, in that it contains an unusually large proportion of manganese carbonate. The proportion of magnesium carbonate, on the other hand, is small.

Soon after leaving Khanian, the road turns round the south-westerly buttresses of the Sahend, and proceeds almost due east to the picturesquely situated village of Alku. The flat-roofed houses are clustered at various levels on and around a small hill, and thus are in pleasing contrast to those of the villages of the plains. On many of the roofs were heaped the large stacks of yellow straw and dark-grey *kiziks* (briquettes of manure for fuel). Then, still skirting the slopes of the Sahend, and crossing several dry torrent beds cut in the familiar sandstone and gravel hills (Appendix, 4, *a*–*e*), we at last descended to the gardens, which always announce the proximity of a Persian town. We entered Maragha by one of the two handsome red-brick bridges built by Hulagu over the Safi Chai.

The hills near Kirjawa, some three hours east-south-east of Maragha, are classic ground to the palæontologist. Here are to be found the fossilized bones of a Pliocene mammalian fauna, which Dr. Forsyth Major informs me is very similar to the corresponding fauna of Samos and Pikermi, in Greece. During the two hours which I was able to spend in the search for bones, I found fragments of mastodon, pig, antelope, gazella, rhinoceros, and the Pliocene horse, *Hipparion mediterraneum*. I am convinced that a more prolonged search would be rewarded by the discovery of complete skeletons embedded in the tufa deposits (Appendix, 5).

BRIDGE OVER THE SAFI CHAI, MARAGHA.

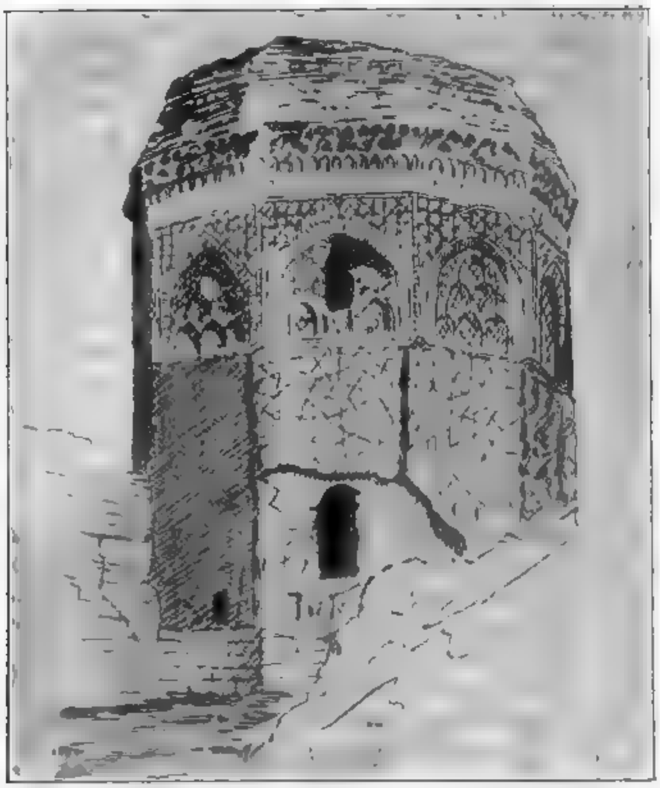
The mud walls of the town are seen on the right. The inset represents the geometrical tilework upon the tower near the eastern end of the bridge.

On leaving Maragha, our route lay between avenues of jujube and walnut trees, through gardens watered by tributaries of the Safi Chai; later, the plain gave place to hills which were composed of slaty rock, and were occasionally capped by deposits of white friable tufa, very like those of Kirjawa (Appendix, 5). Halfway to Miandab, the Murdi Chai has to be forded—an easy matter in September, but probably not so earlier in the year. More slate-hills, and then a conglomerate ridge form the water-parting between the Murdi valley and the large plain of Miandab, drained by the Djaghatu.

A more direct road from Tabriz to Miandab passes through Binab on lower ground nearer the lake. It is conveyed on a causeway across the land most liable to be flooded. In spring, the waters have occasionally been known to reach the little knoll of Binab itself.

Miandab, or Merhemetabad, is a town of five thousand people, on the

western bank of the Djaghatu Chai, and therefore lies between it and the Tatawa Chai (Miandab = between two waters). The Djaghatu is the largest river flowing into Lake Urmi. When I crossed it on September 7, its width was only about 400 feet, and its swift current was only about 2 feet deep in the middle; but in December, Schindler found it to be 600 feet broad, and 3 to 4 feet deep, and in January quite unfordable. In places it must be quite 1500 feet broad, and dangerously deep. Wherever irrigation channels can be made to reach, there are



TOMB OF THE MOTHER OR DAUGHTER OF HULAGU AT MARAGHA.

gardens and vineyards. Flax, cotton, rice, tobacco, melons, and opium, all do excellently in the rich black alluvial soil. Castor-oil plants grow to a height of 7 or 8 feet, and make extremely handsome plants in sheltered situations. Miandab seemed to have completely recovered from the havoc wrought by the Sunnite Kurds in 1881, when three times their number of craven citizens philosophically watched them from the hills at no great distance.

About 3 miles out of Miandab is the Tatawa Chai, which forms the

boundary between the Turki-speaking Shiahs and the Kurdish-speaking Sunnis. The Tatawa and Djaghatu both flow through the same flat plain at no great distance apart; and since their channels are separated by no high ground, their flood waters mix and flow together over the broad marshy plain. In the drier places the uncultivated land was clothed with a rather sparse covering of sun-dried coarse grass, and the broad green leaves of a statice which had flowered earlier in the year. In the moister hollows grow iris and reeds. The main channel of the Tatawa is separated from its Sujbulak tributary by hills of rhyolitic nature (Appendix, 2, 3).

We passed under the interesting Sassanian tombs of Fachrikah, and about 8 miles further reached Sujbulak, the most important Kurdish town in Azerbaijan. It lies on the east bank of the Sanak, a branch of the Tatawa, which was reduced in size in September to about 150 feet. I found comfortable quarters in the house of a Syrian doctor who spoke English. Sujbulak is ruled over by a governor; and many Jews and Armenians carry on its business with the outside world (Russia). In the large caravanserai I met the Armenian merchant, Mr. Hardoun Soulzadiantz, who had collected Coleoptera for Dr. Polak, and who still preserves a bottleful as a memento of his labours. The limestone hills on the west bank of the Sanak are patched and streaked with white, grey, and reddish iron-stained calcareous matter deposited from the water of the springs after which the town is named (Saukbulagh = cold springs, Turkish). In some of the springs the deposition is brought about by a calcareous alga.

The Sujbulak valley is separated from the adjoining plain of Solduz by hills composed of the same limestone as that of Koyun Daghi in the lake (Miocene of Helvetian age).

The plain of Solduz, watered by the Gader Chai, contains innumerable agricultural villages connected by tortuous tracks and irrigation channels, among which it is very easy to lose one's way. We put up in the village of Oksa, at the mud house of Shamasha Josip, who was most helpful in arranging a fishing expedition in the Gader for me. This river, like the others which enter the lake from the south, is noted for the large *Silurus glanis* which it contains, as well as the chub, capoeta, and roach. Water-tortoises (*Clemmys caspia*) and fresh-water crabs (*Telphusa fluviatilis*) are very common. A ridge of hills separates the grazing-land of Solduz from the tilled fields of the plain of Urmi.

In conclusion, it may be observed that the phenomenon of the rise and fall of the waters of Lake Urmi is one which is well worthy of the attention of the scientific geographer. The recent rise observed chiefly on the western side of the lake may only be due to increased rainfall or diminished evaporation, but at the same time there is just a possibility that it is due to some slow earth-movement. For the proper

elucidation of the problem, it is of great importance that an accurate survey of the lake should be made, and that bench-marks should be set up at appropriate places. The observations of the height of the water-level could then all be referred to the same standard marks. Without such marks, it is almost impossible to accurately compare observations made at different spots on the ill-defined marshy shores.

APPENDIX.

Petrographical Notes on Rock-specimens collected by Mr. R. T. Günther in the Neighbourhood of Lake Urmi, Persia.

By Mr. G. T. Prior, M.A., British Museum.

1. Specimens from Bezau Daghi, west side of Lake Urmi.

(*a*) *Pumiceous Hornblende-biotite-andesite.*—The specimen is a rounded block of a white pumiceous rock speckled with small black hornblende crystals and scales of biotite, and showing small crystals of glassy felspar. Under the microscope the felspars are seen to be mostly fragmentary; they show marked zonal structure, and twin laminæ give symmetrical extinction of about 15° (oligoclase-andesite). The hornblende also occurs in small ragged and apparently broken crystals; it has pleochroism: $\mathfrak{a}$ = pale brownish-yellow, $\mathfrak{b}$ = dull greenish-brown, $\mathfrak{c}$ = dull olive-green. These phenocrysts, with biotite and grains of magnetite, are scattered through a colourless, highly vesicular glass. This rock is almost precisely similar to a specimen in the British Museum belonging to the collection made by W. R. Loftus, and labelled "Arin, Lake of Van."

(*b*) *Porphyritic Hornblende-biotite-andesite.*—This is a dark grey rock, showing porphyritic glassy felspars in large amount, with a little biotite and hornblende. The felspar phenocrysts show zonal structure, and, except that they are more perfectly developed, are similar in character to those of the preceding rock. The hornblendes are larger and show slightly different pleochroism: $\mathfrak{a}$ = pale yellow, $\mathfrak{b}$ = brown, $\mathfrak{c}$ = greenish-brown. Most of the sections, however, are parti-coloured, green and brown, as though exhibiting a passage from the green hornblende of the preceding rock to a brown variety. The dense base crowded with dusty material has little action on polarized light, except in parts which present a peculiar mottled appearance, as though from the imperfect development of felspars.

(*c*) *Hornblendic Schist* (*Epidiorite ?*).—This rock presents characters somewhat similar to those of hornblende-schists which are stated to have resulted from the metamorphism of dolerites. It consists of strings and patches of uralitic hornblende (with pleochroism from pale brownish-yellow to dull bluish-green), with interspaces filled with somewhat turbid felspars and a little quartz; irregular patches of sphene occur, generally surrounding grains of iron ore (probably ilmenite, from the alteration of which the sphene has resulted). The rock is similar in character to many of the metamorphosed dolerites (epidiorites) of the Penzance district in the Museum collection; it is almost precisely identical with a specimen of hornblende-schist in the Loftus Collection from Anjulukh Daghi, between Somai and Salmas. This rock is probably connected with the old metamorphic and granitic series of rocks referred to by Grewingk, Loftus, and Blanford as occurring to the north and west of Lake Urmi. In the Loftus Collection in the Museum are specimens of granitic and gneissic rocks and serpentine from near Ushnu to the west of the lake; while from Wurgawiz Daghi on the north-west shore comes a very typical example of pyroxene-granulite with pleochroic hypersthene; and from Guverchin Kala, a

promontory projecting into the lake, a specimen of the granite with pink felspars, referred to by Loftus in *Quart. Jour. Geol. Soc.* xi. (1853), p. 305.

(*d*) A rolled pebble of *reddish quartzite* consists of a medium-grained aggregate of angular fragments of quartz and some felspar, with cross-hatching suggestive of microcline; the interspaces are filled with a finer aggregate of quartz and felspar, while strings of red ferruginous matter throughout the slide indicate incipient foliation. Many of the quartz grains show undulose extinction, and the numerous cracks traversing the specimen show that the rock has been subjected to considerable pressure.

2. Sujbulak, south of Lake Urmi.

Fragmentary Rhyolite ?—This is a pale green felsitic-looking rock, showing small opaque white felspars and numerous minute vesicular cavities filled with red ferruginous material. Under the microscope it is seen to consist of rounded and broken fragments of quartz and felspar in a greenish microfelsitic base showing flow-structure and, in parts, indications of perlitic structure.

3. Road from Miandab to Sujbulak.

Rhyolitic Breccia ?—This dark grey felsitic rock shows under the microscope rounded patches of microfelsitic material, with a few broken fragments of quartz and felspar in a finer-grained microfelsitic base, rendered dense by a greenish-brown alteration product. In some of the coarser-grained microfelsitic patches curved lines of this green alteration product give a distinct suggestion of perlitic structure.

4. Pebbles from the hillside one hour's march north-east of Maragha.

These consist of andesites of varying basicity, from hornblende-andesite to hypersthene-hornblende-andesite and augite-hypersthene-andesite with olivine (basalt).

(*a*) *Hornblende-andesite.*—This is a pink rock showing phenocrysts of glassy felspar and small hornblendes. Under the microscope the felspars show albite and pericline twining and zonal structure; twin lamellæ give symmetrical extinctions of about 15°. The hornblendes show sharply defined outlines of prisms and pinacoids, but are all altered. The rather dense, unindividualized base contains small rectangular sections of felspar.

(*b*) *Hornblende-biotite-andesite.*—A light pinkish-grey rock similar to the preceding, with the brown hornblendes less altered. Deep reddish-brown biotite is also present.

(*c*) *Hornblende-hypersthene-andesite.*—A grey, rather more compact rock than the preceding, showing felspar phenocrysts. Under the microscope the larger zonal felspars are similar to those in the preceding rocks, and give low symmetrical extinction angles (from 6° to 15°); but other smaller felspars which do not show zonal structure are more basic, and give symmetrical extinctions of from 25° to 30°. In the base is a second generation of small felspars in large amount. The brown hornblende phenocrysts are not numerous. Biotite is present in small amount, intergrown with hornblende. The hypersthene only occurs in minute prismatic crystals in the base: they show straight extinction, and some of the larger ones give the usual pleochroism from very pale green to rose-colour. The base appears to be a colourless glass, with globulites and rod-shaped microlites.

(*d*) *Hornblende-hypersthene-andesite.*—In this light grey rock the porphyritic felspars are smaller and less prominent, while the ferro-magnesian constituents are in larger amount than in the preceding rock. The pleochroic hypersthene occurs in porphyritic prismatic crystals of the same size as the hornblendes, and not in the base: the latter consists of a felt of every minute felspar needles with grains of magnetite and probably some glass.

(*e*) *Augite-hypersthene-andesite with Olivine* (*Basalt*).—This rock is of a much

more basic type; it is of a dark grey colour, showing small phenocrysts of altered felspar and pyroxene. The twinned felspars give symmetrical extinctions of about 25°; beside the larger phenocrysts, there is a second generation of smaller prismatic felspars scattered through the base. The pyroxene phenocrysts are mainly of a monoclinic augite, slightly pleochroic, from very pale green to pale yellow: the hypersthene is only in small amount. The base consists of rather indistinct felspars with magnetite grains and a very little granular augite. Scattered through the slide are a number of small orange-red pseudomorphs after olivine.

5. Kirjawa bone-deposit, east of Maragha.

Pumiceous Tuff.—This is a pale brown tuff containing lumps of pumice. The pumice consists of a colourless, highly vesicular glass showing flow structure, and containing fragments of plagioclose felspars and minute needles of green hornblende, similar to that in the pumiceous andesite from Bezau Daghi, described above.

6. Seir conglomerate pebbles.

(*a*) *Granitic* rock with microcline, and showing cataclastic structure.

(*b*) *Felsite* and quartz grit.

(*c*) *Limestone* fragments with fossils.

NOTES ON GLACIERS OF SOUTH-EASTERN ALASKA AND ADJOINING TERRITORY.*

By OTTO J. KLOTZ, Canadian Topographical Survey.

THE writer first visited South-Eastern Alaska in 1889, and spent the seasons of 1893 and 1894, with a steamer at his disposal, along the continental shore-line, in connection with the International Boundary Survey. These notes are, therefore, incidental to other work.

In 1894 a photo-topographic survey was made of the front of the Baird glacier for the study of its motion. The results were published in the *Journal of Geology*, vol. iii. No. 5 (1895), and may be briefly summarized :—

Photographs (photo-topographic camera) taken May 15, 19, July 13, and August 11; base-line, 850 feet, about 1700 feet from glacier, which has a frontage of a mile. Between July 13 and August 11 the end of the Baird glacier was lowered by melting a little over 2 feet, and the average motion of the ice in that part was 1 foot per day. The slope was 1 : 3; the slope of the glacier itself for 15 miles in a straight line is 1 : 20, or nearly 3°. The mean slope of the Patterson glacier, lying south-east of the Baird, is in 10 miles, 1 : 13, or 4° 25′.

The Canadian International Boundary work covers the land area—some 14,000 square miles—adjoining the continental shore-line from Mount St. Elias to Portland canal, and is delineated on twenty-four sheets of 1°—latitude and longitude—contour-lines 250 feet intervals; scale 1 : 160,000, besides one covering the whole on a scale of 1 : 960,000. The topography—contour-lines—is based solely on the camera, and, as such, is the largest photo-topographic survey made anywhere.

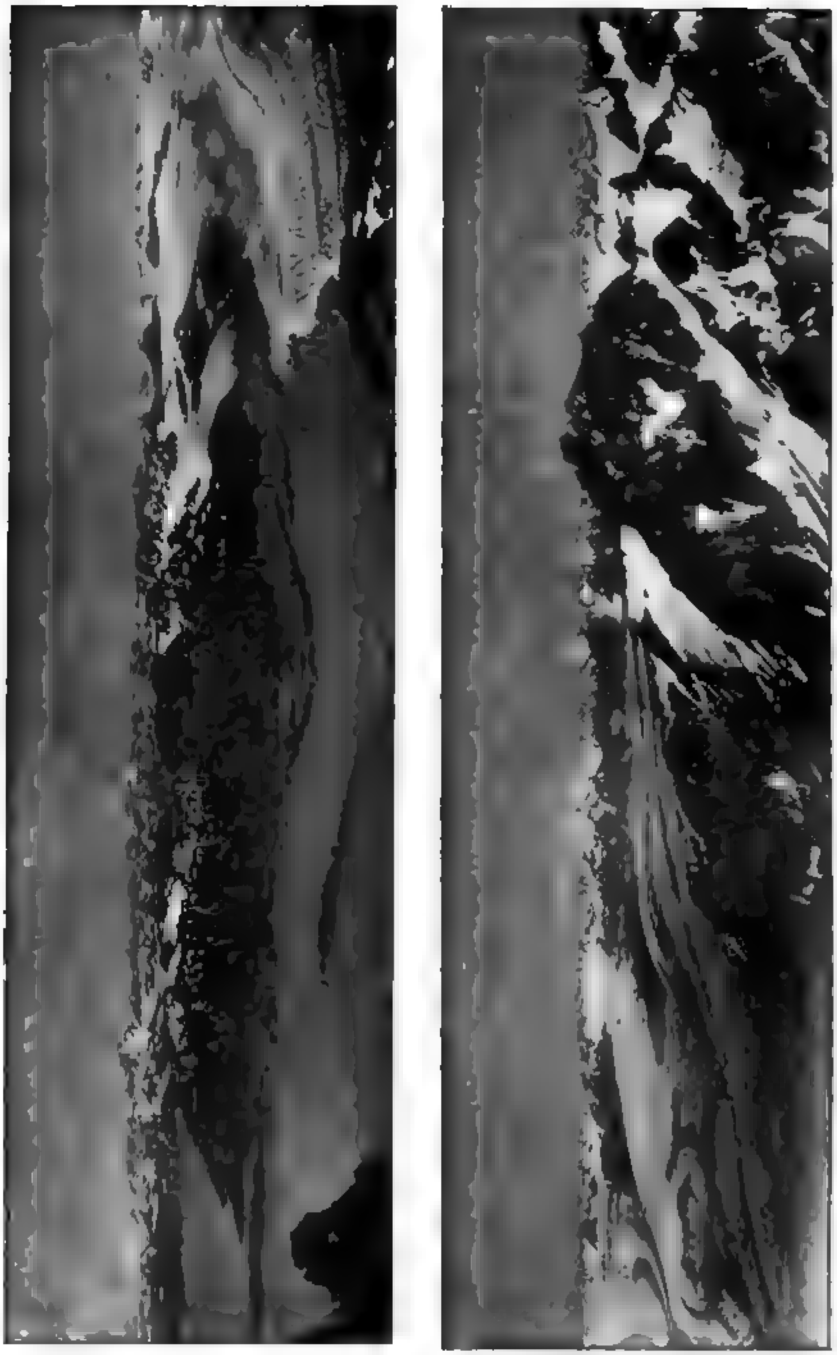
* Maps, p. 592.

The following notes are based on a comparison between the surveys of La Perouse and Vancouver and ours (1893).

The scientific expedition of La Perouse made a lengthened stay with the *Boussole* and *Astrolabe* during July, 1786, in Lituya bay, making at the time a detailed survey of the T-shaped arm, a chart of which on a large scale (1 inch = four-fifths statute mile) is given in his atlas, and is here reproduced, together with one for the same bay enlarged to the same scale from our 1 : 160,000 sheet. Before making a comparison, La Perouse's description of the bay will be given ('Voyage Round the World,' vol. ii. pp. 85–87).

"To form an idea of it, it is necessary to conceive a basin of water, unfathomable in the middle, bordered by peaked mountains of great height, covered with snow, and without one blade of grass to decorate this vast heap of rocks, condemned by nature to eternal sterility. I never beheld the surface of the water ruffled by a single breath of wind. Nothing disturbs it but the fall of enormous masses of ice, which frequently separate from five different glaciers, while the sound is re-echoed by the distant mountains. The air is so calm, the single voice of a man may be heard half a league, as may the cries of a few sea-fowl, which deposit their eggs in the hollows of the rocks. It was at the head of this bay that we hoped to find channels by which we might penetrate into the interior of America. We conjectured it might lead to some large river, taking its course between two of the mountains, and originating from one of the great lakes north of Canada. Such was our chimerical notion, and this was its result. We set off in the two large barges of the *Boussole* and *Astrolabe*. Messrs. de Monti, de Marchainville, de Boutervilliers, and Father Receveur accompanied M. de Langle, and Messrs. Dagelet, Boutin, Saint-Ceran, Duche, and Prevost were with me. We entered the channel on the west. Prudence required us to keep some distance from the shore on account of the falling ice and stones. At length, after having rowed a league and a half-mile, we found the channel terminated at two vast glaciers. We were obliged to push away the flakes of ice with which the sea was covered to penetrate thus far, and the water was so deep that I could find no bottom at half a cable's length from the shore with a line of 120 fathoms. Messrs. de Langle, de Monti, and Dagelet, with several other officers, attempted to ascend the glacier. With unspeakable fatigue they advanced 2 leagues, being obliged at extreme risk of life to leap over clefts of great depth; but they could only perceive one continued mass of ice and snow, of which the summit of Mount Fairweather must have been the termination. . . . I had sent M. de Monneron and M. Bernizet to explore the eastern channel, which terminated like this, at two glaciers Both these channels were surveyed, and laid down in the plan of the bay."

With reference to the two accompanying charts of Lituya bay, few



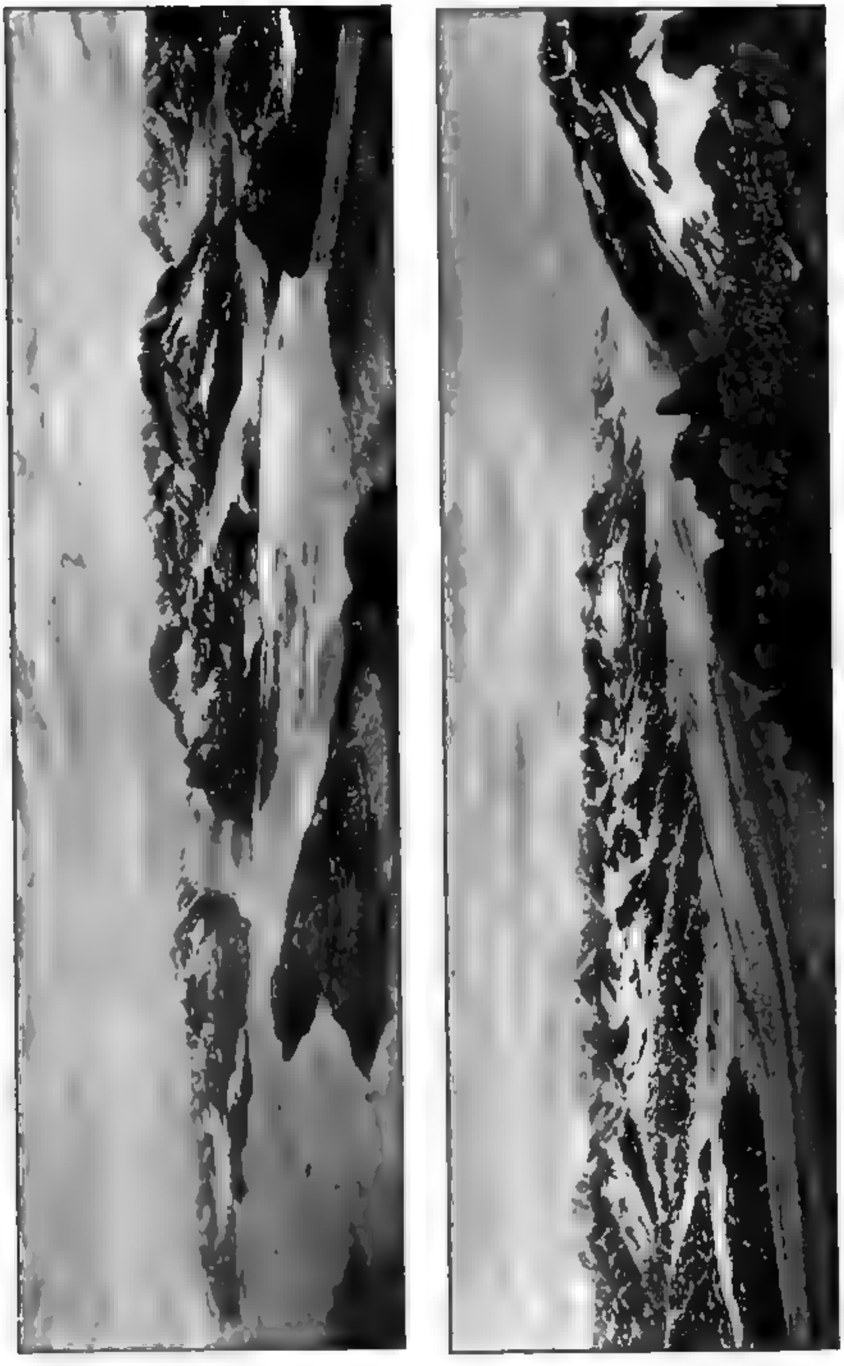
PANORAMA OF MUIR GLACIER.

words are necessary, as they speak for themselves. La Perouse's is from a hydrographic survey; the Canadian from a topographic survey, and the two are fairly accordant.

It will be seen that the two large glaciers of the northerly arm are now united, and have advanced into the arm fully 3 miles, and into water where La Perouse failed to find bottom at 120 fathoms. Similarly, the glaciers of the southerly arm have united and advanced about 2½ miles. These distances represent the sum of the fluctuations during the century. Of the fluctuations themselves we at present know nothing. On La Perouse's chart will be seen a small glacier near the middle of the northerly arm and reaching to the water; on the recent chart this glacier is still shown, but as having receded from the water's edge. We have, therefore, the apparent anomaly of advance and recession of glaciers side by side. Perhaps not too much weight should be given to La Perouse's sketching (to the water's edge) of this small glacier. However, the proof of the advancement of the large glaciers is incontrovertible. It is not the intention, in the present paper, to enter into a discussion of the climatic or other reasons that brought about this change, but simply to state facts.

Leaving now Lituya bay and proceeding some 45 miles south-easterly, we come to Cape Spencer, from which point Mr. Whidbey, under Vancouver's direction, made a connected survey of the continental shore-line along Cross sound, Lynn canal, Stephen's passage, and Frederick sound to the muddy waters of the Stikine. For the purpose of this paper, the most interesting part of this survey is from Cape Spencer to the vicinity of Point Carolus. I have plotted his courses through this interval, and am satisfied of their accuracy by comparison with our survey.

Let me quote from Vancouver (vol. v. pp. 416, 417): "He (Whidbey) commenced on the forenoon of the 10th (July, 1794) from Cape Spencer, with very thick, foggy weather; this inconvenience, in addition to the immense numbers of huge pieces of floating ice, very much retarded his progress across the sound. Having at length effected this object, the continental shore from the cape above mentioned was found to take nearly a north direction for about three leagues to a low pebbly point; north-north-west from which, 5 miles further, a small brook flowed into the sound, and on its northern side stood the ruins of a deserted Indian village. To reach this station, the party had advanced up an arm about 6 miles wide at its entrance, but which had decreased to about half that width, and there further progress was now stopped by an immense body of compact perpendicular ice, extending from shore to shore, and connected with a range of lofty mountains that formed the head of the arm, and, as it were, gave support to this body of ice on each side. Their course was now directed across the arm and on its eastern side; compelled by the inclemency of the weather, the party stopped until it should prove more favourable to their purpose. These



PANORAMA OF JOHNS HOPKINS GLACIER.

shores are composed of a border of low land, which on high tides is overflown and becomes broken into islands."

Although in this description Vancouver does not state how far the ice-front was above the "small brook" or "deserted Indian village," yet, in his further description of the next inlet or arm east of Point Wimbledon (now known as Dundas bay), we find, p. 419: "Beyond them (islets and rocks) on the western shore was a small shallow opening that appeared to communicate with one of a similar description, and which had been noticed in the other arm (Taylor bay as now known) a few miles below the icy barrier, but was too shallow to be approached by the boats."

This, then, gives us a pretty fair idea of where the ice-front was in Taylor bay. I have designated by A (see chart) the "shallow opening" in Dundas bay, and by B the one in Taylor bay referred to, and likewise have plotted the position of the "small brook," "deserted village," and ice-front. The main fact elicited is that the glacier (now known as the Brady) has advanced over 5 miles. Furthermore, the "deserted Indian village" is now covered by nearly 1000 feet of ice; similarly, the brook and, besides, the waters flowing from that part of the glacier now flow westward into the Pacific instead of southerly. An examination of the chart furnished the explanation. This advancement within exactly one hundred years is large; the burying of the village under so vast a load of ice adds interest to this glacial motion, which, however, is far eclipsed by the phenomenon of opposite character—recession—in the neighbouring Glacier bay.

Let us again quote Vancouver (p. 421) for the description of that which is now designated as Glacier bay: From "Point Dundas, situated in lat. 58° 21′, long. 224° 1′, the coast takes an irregular east-north-east direction about 7 miles to a point. . . . To the north and east of this point the shores of the continent form two large open bays, which were terminated by compact solid mountains of ice, rising perpendicularly from the water's edge, and bounded to the north by a continuation of the united lofty frozen mountains that extend eastward from Mount Fairweather. In these bays also were great quantities of broken ice, which, having been put in motion by the springing up of a northerly wind, was drifted to the southward, and, forcing the boats from the northern shore, obliged them to take shelter around the north-east point of the above island" (Lemesurier).

From Vancouver's measurement, it would appear that the point now known as Point Carolus has either emerged or advanced eastward since his time. The main fact, however, is the position and limit of the "two large open bays." From his chart (not given here) they are shown as less than half the depth of the arm adjoining Cape Spencer, *i.e.* about 5 miles. There is no doubt in my mind about the accuracy of the position given of the ice-front at that time, and that there was practically no

Glacier bay save the relatively small indentations compared with the present bay.

Referring to the chart of 1894, it will be seen that the ice-front of 1794 has receded upwards of 45 miles in a north-westerly direction, and that part, so well-known as the Muir glacier, has receded 25 miles. The latter glacier has been fully described by Prof. John Muir, Prof. G. F. Wright in *American Journal of Science* for January, 1887, and also by Prof. Harry Fielding Reid in the *National Geographic Magazine*, vol. iv., March, 1892. Willoughby island, with an elevation of 1545 feet, gives

LOOKING WESTERLY, JOHNS HOPKINS GLACIER TO RIGHT.

ample evidence of having been entirely covered with ice recently, and the ice-markings on mountains adjoining the eastern (1894) terminal of the Muir glacier are at an altitude of about 2500 feet, from which we obtain the maximum slope of the glacier between those points to have been 32′, which is very small compared with those given for the Baird and Patterson. However, even at that small angle of incline we would find the depth of the glacier to be 3400 feet where now the Grand Pacific and Johns Hopkins glaciers discharge into this bay. From that point of elevation it seems probable that the ice would seek the shorter route to the sea and move towards Taylor bay, into which now the Brady glacier discharges. At the present time the ice over this stretch moves in both directions, one south into Taylor bay, the other north into the north-west arm of Glacier bay. A future examination of the ice-markings below the 4000-foot level on the rocks south of the above

north-west arm will definitely settle the direction of the former ice-flow there.

From the preceding we see, therefore, that we have two ice-streams, whose mouths are within 20 miles of each other; the one has receded within a hundred years fully 45 miles, while the other has advanced over 5 miles. Abut this the proofs seem absolutely conclusive.

Of the other glaciers along the continental shore-line, eastward from Glacier bay as far as the Stikine, we have no survey or measurement by Vancouver (or any one else) to enable us to make comparisons with their present position, and for that purpose must rely simply on his general description of them. Reading Vancouver carefully, and from the writer's intimate knowledge of that continental shore-line, I think I am correct in saying that in that latter region all the glaciers have receded since the days of that illustrious explorer.

It seems somewhat strange that Vancouver does not mention what is now known as the Davidson glacier; although, in passing close in-shore, the woods on the terminal moraine may have hidden it, yet he must have seen it from the opposite shore afterwards.

As the works of Vancouver are probably not very accessible, and for future reference, it is considered desirable to quote some extracts pertaining to glaciers.

Of the head of Chilkat inlet, Lynn canal, at the mouth of the Chilkat river, we find (p. 426, July, 1794), "It was here remarked that, notwithstanding the quantity of fresh water which flowed into this arm from the brook just mentioned, the shores were perfectly free from ice, although they were three-fourths of a degree to the north of those parts that had undergone the examination of the party in the early part of their present expedition, where they had been much annoyed by ice, and it became another instance of the local existence of these substances."

Of the channel (Gastineau) lying between Douglas island and the mainland, we read (vol. vi. p. 20), "About three leagues up this arm is a small islet nearly in mid-channel. This afforded another instance of the partial existence of the ice, which here entirely blocked up this arm." And again, on p. 25, when returning from Barlow's cove, down Stephens passage, "The point on which the northern village is situated was found to be, as had before been conjectured, the west point of entrance into the narrow icy arm (Gastineau). . . . The channel between this island and the mainland, being rendered by the ice impassable, the boats were steered over to the southern shore for protection against the south-east wind." At the present time ice is occasionally drifted into this channel from Taku inlet, but certainly not to the extent described by Vancouver. More must then have been discharged from Taku inlet, and possibly some from the Mendenhall at the west entrance, which now, however, does not reach tide-water.

Of Taku inlet Vancouver says (vol. vi. p. 26, August, 1794), "in which the great quantity of floating ice, with a strong northerly wind against them, so retarded their progress that a passage was with great difficulty effected. . . . From the shore of this basin" (north of Taku point) "a compact body of ice extended some distance nearly all round. . . . From the rugged gullies in their sides were projected immense bodies of ice that reached perpendicularly to the surface of the water in the basin, which admitted of no landing-place for the boats, but exhibited as dreary and inhospitable an aspect as the imagination can possibly suggest."

LOOKING NORTHWARD OF LITUYU BAY, SHOWING ONE ICE-FRONT.

At the present time there is only one glacier (Foster) discharging directly into the sea, the others having receded, and the gullies are not now so generally filled with ice.

Coming further south; of Holkham bay we find (vol. vi. p. 29, August, 1794), "Much floating ice was seen within the islands" (near the middle at the entrance of the bay). Little or no ice is found there now. In the neighbouring Tracy arm and Endicott arm quite a quantity of small floes may be met, and occasionally pieces are floated out into Holkham bay and Stephens passage. The inference is, therefore, for a diminution. These two arms show unmistakable signs, by their bare marked rock walls, of recent recession.

Sir George Simpson, writing of the same neighbourhood in September, 1841, says, in his 'Journey Round the World,' vol. i. p. 218, "Next

morning we passed through Wrangell straits and Prince Frederick's sound, respectively 22 and 57 miles long, and halted for the night at the entrance of Stephens passage. The valleys were lined with glaciers down to the water's edge; and the pieces that had broken off during the season had filled the channels and straits with fields and masses of ice, through which the vessel could scarcely force her way. Starting again at five in the morning, with a foul wind and thick fog, we ran through Stephens passage; and, when the mist cleared sufficiently for the purpose, the land on either side displayed to us mountains rising abruptly from the sea, and bearing a glacier in their every ravine. Earlier in the season these glaciers would have been concealed by the snow, but now they showed a surface of green ice."

This latter description indicates a great diminution of the glaciers in fifty years, *i.e.* subsequent to 1841, and in the quantity of floating ice encountered in Stephens passage, where now only an occasional floe is seen. Simpson speaks of Gastineau channel, already referred to, as being "generally obstructed by ice."

The vicinity of the Horn cliffs, proceeding south-easterly down Frederick sound, is described by Vancouver, vol. vi. pp. 31, 32 (August, 1794): "A few miles to the south of this margin the mountains extended to the water-side, where a part of them presented an uncommonly awful appearance, rising with an inclination towards the water to a vast height, loaded with an immense quantity of snow and ice, and overhanging their base, which seemed to be insufficient to bear the ponderous fabric it sustained, and rendered the view of the passage beneath it horribly magnificent. Soon after passing this very remarkable promontory, the arm of the sea over which it hangs appeared to be entirely enclosed by a beach, extending all round the head of it; at the south-east extremity was a large body of ice, formed in a gully between the mountains that approach the water-side, from whence much broken ice seemed to have fallen and had entirely covered the surface of the water in that direction."

From the latter part of the above, it would appear that Whidbey was near the mouth of the present Le Conte bay, into which discharges the Le Conte glacier, the most southerly (lat. 56° 49′) at present of living glaciers on the continental shore, but the bay seems to have been filled by the glacier, for no bay is shown (on Vancouver's chart) which is now 6 miles deep. It may be stated that the position given for the ice-front of the Le Conte glacier by the United States Coast Survey, and that made some years later (1893) by us, show a recession of fully half a mile.*

* The definite year in which the United States survey was made is not at the moment known to the writer, but it was probably in the later eighties; hence the exact interval cannot be given. Le Conte bay is not mentioned in the United States Alaska Coast Pilot for 1883, but is given in the one of 1891.

Again referring to Vancouver (vol. vi. p. 34), "Mr. Whidbey observes that in no instance during his researches, either in the several branches of Prince William sound, or in the course of his present excursion, did he find any immense bodies of ice on the islands; all those which he had seen on shore were in the gullies or valleys of the connected chain of lofty mountains so frequently mentioned, and which chiefly constituted the continental shore-line from Cook's inlet to this station; though in different places these mountains are at different distances from the seaside. He likewise observes that all the islands, or groups of islands, were of a moderate height, when compared with the stupendous mountains that compose the continental boundary, and

BRADY GLACIER, TAYLOR BAY.

were still seen to continue in a south-eastern direction from this shallow passage, whilst the land to the westward assumed a more moderate height, was free from snow, and produced a forest of lofty pine trees."

The conclusions arrived at are, that the glaciers eastward of Glacier bay have all diminished since Vancouver's time, *i.e.* within the past hundred years. This does not exclude the fact that some dead glaciers may have and have advanced (*e.g.* the Patterson) for a year or so, due to heavy precipitation and accumulation of snow on the *névé*. The mere fact of recession must have tended to raise the average temperature of the area, and thereby still more hasten recession.

There are no meteorological data for that region covering the period

under discussion that might lend their aid in determining the reasons for the variation of the glaciers. Besides the effect of meteorological conditions, we must not lose sight of those due to physiographic changes.

With reference to the encroachment of the ocean and subsidence of the land, Vancouver writes (vol. vi. pp. 53, 54), ". . . He" (Whidbey) "also states that in his last two excursions" (between Cape Spencer and foot of Frederick sound) "several places were seen where the ocean was evidently encroaching very rapidly on the land, and that the low borders extending from the base of the mountains to the seaside had, at no very remote period of time, produced tall and stately timber, as many of their dead trunks were found standing erect, and still rooted fast in the ground in different stages of decay, those being the most perfect that had been the least subject to the influence of the salt water, by which they were surrounded on every tide; such had been the encroachment of the ocean on these shores, that the shorter stumps in some instances at low-water mark were even with or below the surface of the sea. This same appearance has been noticed before in Fort Chalmers, and on this occasion Mr. Whidbey quotes other instances of similar encroachment, not only in Prince William sound, but also in Cook's inlet."

Probably nowhere on the earth are better opportunities afforded for the study of living and dead glaciers than on the north-west continental shore of America. Within recent years the region has become easily accessible, and with the accurate delimitation of the shores and the position of the glaciers in 1893 and 1894, future surveys of the latter will furnish accurate data for the study of glacial motion.

It is desirable that future investigators leave readily recognizable marks near the ice-front (as was done by the writer in the survey of the Baird in 1894, with white lead on the adjoining bare rock wall), as such are preferable for the determination of the smaller fluctuations of the glacier. Whatever methods of measurement and survey are used, it cannot be too strongly recommended that photographs be taken with a camera of fixed and known focal length from a properly oriented base-line. The study of the motion of glaciers will then be reduced to an exact science.

THE SWEDISH EAST GREENLAND EXPEDITION.

(PRELIMINARY NOTE.)

By Dr. A. G. NATHORST.

THE Swedish expedition, under my leadership, to East Greenland in search of Andrée, to which the Council of the Royal Geographical Society had granted a contribution of £100, arrived safely at Malmö September 12. Although the expedition as regards Andrée was unsuccessful—no traces whatever of his expedition having been met with

—it has from every other point of view been a great success. After having made soundings and done hydrographical work in the Atlantic, the expedition arrived at Jan Mayen on June 12, and stayed there till the 24th, making scientific researches and collections, the *Antarctic* being the first Swedish vessel which has visited this interesting island. There were some very fine days, during which Beerenberg exposed itself in all its magnificent splendour. The margin of the ice-pack was met with in the north of Jan Mayen the evening of June 24, and was followed against north-east and north until early on the 27th, when the ice (at 73° 12′ lat., 5° 10′ long. W.) allowed us to make way towards the north-west. The open water between the ice-pack and land was reached July 2, after some very hard work in the last part of the way, the ice being very dense. We reached the coast a little south of Shannon island at 74° 50′, but the island itself could not be reached in consequence of the conditions of the ice and the almost continuous fog. We then examined Pendulum island and Sabine island. On Walrus island a depôt for Sverdrup was erected, and information thereof was laid in different cairns along the coast. Then we landed at Flache bay, Cape Borlase Warren, Cape Berghaus, and Cape Mary (Clavering island), whence we went to Cape Broer Ruys (Hold with Hope) and the coast between this and Mackenzie bay. Franz Josef fjord being still covered by the land-ice, and we having been enclosed in the ice in Foster bay, I went southwards July 22 to Scoresby sound, with the intention of returning northwards to Franz Josef fjord later in the season. The Bontekoe island, as well as Cape Parry, was visited over the land-ice, and then we landed at Murray island, north of Liverpool coast. This coast being almost free from ice, we landed in Holloway bay, and thence went to Scoresby sound, where we anchored at Cape Stewart, July 29. Here the house and depôt of Lieut. Ryder were examined, but no traces of Andrée were found. I then went up Hurry inlet, and anchored north of the Fame islands, where we dwelt until August 7. The whaler *Balæna*, captain Th. Robertson, from Dundee, which we had met in the ice as well as at Pendulum island and south of Shannon island, visited us here and took some letters to Iceland on her way to Davis strait. The inner part of Hurry inlet was mapped by Mr. Dusén, and interesting scientific researches were made.

In the evening of August 7, I went from Hurry inlet, and reached Franz Josef fjord, August 9. The land-ice was now gone away or melted, and we reached the bottom of the fjord next morning. The German map of the outer part of the fjord is tolerably good, while the map of the interior is quite wrong, the fjord being in reality narrower and not wider towards the interior, and the interior part lying 2° of longitude farther east than the map indicates. It is thus much smaller than on the map, and the Petermann spitze is probably only two-thirds as high as Payer supposed. A base-line was measured

in the interior of the fjord, and the mapping begun from the *Antarctic*, the fjord being too great to be mapped during boat-journeys, and too narrow and high for mapping in the photo-grammetrical way during the short time at our disposal. The mapping was made by Mr. Dusén, while the astronomical positions were determined by Dr. Åkerblom. We now went outwards, and having, on August 14, entered the southern branch of the fjord east of Payer spitze, found that this branch was a sound (named the Antarctic sound) which led to a hitherto unknown magnificent great fjord, which was named King Oscar's fjord. This fjord stretches southwards to Davy sound, and sends two branches to the eastward, which connect it with the sea. Mountnorris inlet on Scoresby's map is only a bay, Cape Parry and Traill island being in reality connected with each other. On the western side King Oscar's fjord sends two branches into the interior, the southern of which divides in two, the northern in three, branchlets. They go almost as far west as the interior of Franz Josef fjord.

The surroundings of King Oscar's fjord are beautiful and splendid. As Davy sound was covered by thick land-ice, and as this ice also blocked the second outlet eastwards, we were obliged—which we should have done in any case—to return northwards through Antarctic sound to Franz Josef fjord, the mapping of King Oscar's fjord having been finished. It was most interesting indeed to go about 800 nautical miles in these waters, where no ship had plunged its keel before us. On August 24 we returned to Franz Josef fjord, the mapping of which was now continued until the evening of August 30. There were discovered some new branches of this fjord, one of which, east of Waltershausen glacier, stretches itself far eastwards. On the 30th, in the evening, we left the Greenland coast, and had a very easy escape through the ice with exception of the margin itself, the penetration of which took three hours of hard work, almost constantly ramming. At 7 o'clock a.m., September 1, we had left the ice behind us.

The summer must be regarded as unusually fine. We were certainly in the beginning very much hindered by the fog, but from July 29 to August 30 there was sunshine every day, and often calm weather. Even the high mountains (5000 to 6000 feet) around Franz Josef fjord and King Oscar's fjord were never hidden by clouds during our stay there. It was also very fortunate that we had coal enough, for our way in King Oscar's fjord and Franz Josef fjord measured 1044 nautical miles. When leaving Helsingborg, May 25, I had taken 237 sacks of coal on deck, and at my return to Stockholm had still about 70 tons on board. As to the search for Andrée, I regard it as proved that he has not come to this coast; otherwise we should necessarily have found some traces of his expedition, but as such were wanting from 70° to 75° N. lat., he cannot have been here.

The geographical work of the expedition consists of the mapping the interior of Hurry inlet, the discovery of King Oscar's fjord with its

many branches, and the mapping on 1 : 200,000 of this great fjord, and the whole of Franz Josef fjord. The maps will hereafter be totally different from their present appearance. The astronomical observations at Murray's island will also alter the position in longitude of the Liverpool coast. As to the geological work, I will here only mention the discovery of the Silurian and Devonian systems, both of which were hitherto unknown on this coast. From the zoological point of view, we have secured twenty-eight musk oxen, all of which were prepared in some way or another so that we had skeletons, skins, all the interior parts, brains, etc., brought home. Seventeen polar bears and nine reindeer were also secured. A very interesting discovery is the fact that the white polar wolves have made an invasion around the northern part of Greenland along the whole coast, at least to Scoresby sound, where two specimens were seen. A skin was procured from a Norwegian sealer at Clavering island. The reindeer are now very scanty in consequence of their having been killed by the wolves. Also a specimen of the lemming (*Myodes torquatus*) was obtained in King Oscar's fjord. Besides, we have made great ornithological collections, and have dredged everywhere. North of Jan Mayen an *Umbellularia*, which measured 2 meters 12 centimeters in length, was obtained. Also insects, etc., were collected. The botanical collections are very complete, and some specimens new for Greenland or the coast were found, of which I only mention *Pleuropogon Sabinei*, discovered at Hurry inlet, and only once before found in Greenland (by myself at Cape York, 1883). Also great collections of driftwood were made. Hydrographical researches were made as well during our journey northwards as during our return journey in "the Norwegian depth" and other localities, and many hundred bottle-letters were thrown out in order to ascertain the ocean currents. Astronomical and magnetical determinations were made at different localities on the coast. An interesting ethnographical collection was made in the old huts of the Eskimo, who formerly lived on this coast, and eighteen skulls from old graves were brought home.

THE SEVENTH INTERNATIONAL GEOGRAPHICAL CONGRESS

In accordance with the resolution passed at the Sixth International Geographical Congress held in London under the auspices of the Royal Geographical Society in 1895, the Seventh Congress met in Berlin, where all arrangements were carried out by the Berlin Geographical Society, under the presidency of Baron von Richthofen. The preparations for the Congress and the preliminary organization have been referred to frequently in recent numbers of the *Journal*. The building of the Prussian Chamber of Deputies (Abgeordnetenhaus), placed at the disposal of the Congress by the Prussian Government, formed not only a magnificent but a most comfortable place of meeting. The ground floor contained

tables for issuing programmes, etc.; a range of pigeon-holes bearing the numbers of members' tickets for the distribution of abstracts, invitations, etc.; and a large and well-managed cloak-room. On the first floor the great hall for the general meetings occupied the centre, while round it were grouped conversation-halls, reading-rooms, writing-room, restaurant, and a suite of rooms set apart for lady members and associates. Two convenient section rooms were situated on the second floor. The plan of the meetings, as at London, included a general gathering in the forenoon for papers of general interest, and three simultaneous sectional meetings in the afternoon for papers likely to appeal mainly to specialists. In addition there were occasional sub-sectional meetings in smaller rooms.

The general work of the Congress was carried on in a simpler manner than in London, the daily journal being superseded by a programme giving the proceedings for every day issued beforehand in the three languages. The prominence given to German and French in the written and spoken business of the Congress in London was not on this occasion accorded to English and French. The gathering was in fact less representatively international, though somewhat more numerous than in London. The total membership was about 1600. Amongst those present there were about 205 foreigners, *i.e.* natives of countries outside the German Empire, and of these about 61 were British subjects and 20 Americans. There were about 500 foreigners at the London Congress.

The whole setting of the Congress was in harmony with the splendour of the place of meeting. Social attentions of almost overwhelming generosity were shown by the Imperial Chancellor, the city of Berlin, and the Berlin Geographical Society; while before and after the meeting the members who took part in the various excursions were welcomed with the most lavish hospitality by the geographical societies and municipalities of all parts of the empire.

An informal evening gathering on September 27 served as a prelude to the formal opening ceremonial of the 28th, which took place at 10.30 a.m., when the members met attired in evening dress or uniform, and addresses of welcome were presented. The patron of the Congress, H.R.H. Prince Albrecht of Prussia, spoke in the name of the Emperor, who afterwards exchanged congratulatory telegrams with the Congress; and the Imperial Chancellor, Prince Hohenlohe, expressed the feelings of the Empire. Herr Studt, the Prussian Minister of Education, gave a welcome on behalf of the Prussian government, and the Burgermeister of Berlin on behalf of the city. The President of the Congress, Baron Richthofen, then delivered an inaugural address, the main subject of which was the progress of geography during the nineteenth century, and for this a vote of thanks was proposed by M. Semenoff, seconded by Sir Clements Markham. As President of the

previous Congress, Sir Clements Markham presented the report of the permanent bureau, and laid down his office with the words—

"As President of the permanent bureau of the Sixth International Geographical Congress, it now becomes my duty, and that of my colleagues, the secretaries, to hand over the work to our successors, and to give an account of our proceedings during the four years of our tenure of office.

"The Sixth Congress resolved that the officers of each Congress should continue to act until the meeting of the succeeding Congress, to carry out the resolutions that were passed as far as possible, and to present a report at the termination of their period of office, on the work that had been done in the interval. That report is now presented to the Seventh Congress, and will be considered and discussed in detail. I trust that it will show that the officers of the Sixth Congress have endeavoured, to the best of their power, to carry out the resolutions that were passed, and that any failure to attain the results that were desired is due to faulty organization, and not to any want of diligence. I can testify to the zeal and ability with which the work has been conducted by the able secretaries of the Sixth Congress, Dr. Keltie and Dr. Mill. Their experience will be valuable in deciding upon any improvements in the working of the administration, which may be discussed and inaugurated during the sittings of the Seventh Congress. I may mention one difficulty which we found insuperable. It was the assembly of international committees in accordance with resolutions or with subsequent recommendations. This difficulty, no doubt, among other points, will be considered and remedied by the wisdom of the authorities of the Seventh Congress. Another difficulty was to induce the various geographical societies to enter into correspondence, or to discuss the questions raised by the resolutions passed by the Congress. Scarcely any answers were received to the letters addressed to the societies by the officers of the Congress.

"In spite of these difficulties, five at least of the resolutions entrusted to the officers of the Sixth Congress have been successfully carried out.

"With regard to the triangulation in Africa, recommendations are submitted in our report for the consideration of the Seventh Congress. But I must be allowed to take this opportunity of referring, in high terms of praise, to the German triangulation from Nyasa to Tanganyika, carried out for the most part by Dr. E. Kohlschütter. His English colleague, Major Close, bears testimony that this German triangulation is the best in tropical Africa.

"We also submit recommendations with regard to the proposed map of the world on a scale of 1 : 1,000,000. With regard to the third resolution, we came to the conclusion that the admirable bibliography published by the Berlin Geographical Society fulfilled all the requirements.

"Four other resolutions of the Sixth Congress have been carried out fully, and these are the most important. It was desired that there should be a British representative on the International Geodetic Association. Through the exertions of the officers of the Sixth Congress, the appointment of such a representative has been made. It was desired that seismic observations should be established. They have already been established in several important centres, thanks mainly to the exertions of Prof. Milne. The hydrographic researches in the North sea, the importance of which was recognized by a resolution of the Sixth Congress, will shortly be undertaken, as the result of the Conference at Stockholm, under the combined auspices of the British, German, and Scandinavian Governments.

"But I think that the resolution of the Sixth Congress, which will be most thoroughly and satisfactorily carried out, is that relating to the exploration of the antarctic regions Well-equipped expeditions will start from England and from Germany in 1901, with funds supplied both by the liberality of private individuals and by grants from the respective governments. The two sources of supply prove that these most important geographical enterprises are not only supported by the enthusiasm of the peoples, but also, owing to a conviction of their utility and of the scientific value of their results, by the two governments.

"I trust that the suggestions in our report will point the way to further improvements in the administrative arrangements of the Congress.

"It is now my very agreeable duty to resign my office as President to so distinguished a successor as Baron Richthofen, now President of the Seventh International Geographical Congress. His leading position as one of the first of living geographers reflects prestige and honour on any assembly over which he may preside; and we, members of the Seventh Congress, have to give him our most especial thanks for the trouble and pains he has taken to render this Congress a great success. Under his presidency it is as sure to lead to valuable scientific results as it is to be agreeable and pleasant to its members.

"There is only one source of regret, and that is the absence, through illness, of the Baroness Richthofen, who is so well known to so many of us, and who will be missed by her numerous friends. That her recovery will be speedy and complete is, I am sure, the earnest hope of all the members of this Congress. I now resign my office as President into the hands of my illustrious successor, Baron Richthofen."

Altogether the programme of the Congress contained 150 papers, a number so great that it was impossible to give a fair chance to all, and several authors, seeing the hopelessness of obtaining a hearing, withdrew their communications or gave them in brief abstract. The audiences were remarkably enduring, permitting many papers of little interest

to be prolonged far beyond the twenty minutes allotted for them; but the result was the curtailment of some interesting discussions. The conclusions of most of the more important papers were embodied in resolutions, which, after being discussed in the sectional meetings, were accepted at the concluding general meeting; the resolutions as finally adopted are given at the end of this article. For the rest, it is only possible to refer to a few of the outstanding papers. The most interesting in many ways was Dr. Nansen's summary of the scientific results of his great arctic drift, with special reference to the depth of the North Polar basin, and the temperature and circulation of water in the arctic sea. Another part of the work of the *Fram* expedition was dealt with by Prof. Mohn of Christiania, who discussed the meteorological observations in detail.

The approaching antarctic explorations were the subject of two papers and some discussion. Dr. Erich von Drygalski, the designated leader of the German expedition, described the general scheme of the intended work, and submitted a detailed description of the vessel and her equipments. Sir Clements Markham described the methods and plans of the British expedition, and both speakers laid stress on the importance of co-operation in the work of antarctic exploration on the part of the two expeditions. M. Arçtowski gave a short account of the scientific results of the *Belgica*; and Prof. Nielsen, of Christiania, described the voyage of the *Southern Cross* to Cape Adare.

Oceanographical papers and discussions were a distinct feature of the Congress. The *Valdivia* expedition was dealt with by its leader, Prof. Chun; the Prince of Monaco described his cruise of last summer on the coast of Spitsbergen; and Sir John Murray discussed the distribution of deep-sea deposits. Questions of uniformity in international usage as to nomenclature and methods of working received a good deal of attention; and as regards oceanographers, the representation at the Congress was remarkably complete and international.

Other departments of physical geography were also well represented. Professors de Lapparent, Penck, and Davis dealt in masterly fashion with various points of geomorphology; Professor Gerland and others took up the question of seismology, and advocated the more earnest international study of earthquake phenomena; while Baron de Geer, Prof. Wahnschaffe, and others gave attention to glacial phenomena. Many important papers on plant-geography were read by well-known specialists, including Professors Engler, Drude, Warburg, Nehring, and Krasnoff, and this subject was perhaps the most thoroughly discussed with the exception of oceanography.

Besides a considerable number of travel papers by German explorers of repute, there were several valuable communications on the physical structure of particular regions. Thus M. Obrucheff discussed the mountain systems of the Trans-Baikal region of Siberia on the basis of

journeys carried out between 1895 and 1898, and Dr. Philippson dealt similarly with the Ægean region.

Historical geography claimed several weighty expositions, one by Prof. Ratzel on the origin and distribution of the Indo-Germanic peoples, and one by Prof. Sieglin on the ancient discovery of England, being specially worthy of remark. In anthropogeography there were also many important papers, and geography in education claimed its due amount of attention.

While it would be impossible to give a list of the 150 or more papers presented to the Congress, it is interesting to notice those contributed by English-speaking people who took part in the scientific work of the meeting to a greater extent than at any of the previous Congresses —that in London, of course, excepted. These papers were—

Sir Clements Markham, On the British Antarctic Expedition.
Mr. John MacEwan, The Geographical Distribution of the Tea-plant.
Mrs. Zelia Nuttall (Cambridge, Mass.), On the Plans of the Ancient American Cities.
Sir John Murray, The Distribution of Deep-sea Deposits.
Dr. H. R. Mill, On the Adoption of Metric Units in Scientific Geographical Work; and On the Terminology of the Forms of Sub-Oceanic Relief.
Major F. J. S. Cleeve, A System of comparing Geographical Distances.
Prof. W. M. Davis (Harvard), The Geographical Cycle.
Mrs. Gordon, On the Basins of Southern Europe.
Mr. Vaughan Cornish, Association of the Study of Waves to Geography.
Dr. J. Scott Keltie, On the Desirability of obtaining more Accurate Knowledge of the Population of Countries where there is no Organized Census.
Dr. F. Boas (New York), The Jesup North Pacific Expedition.
Miss Owen (St. Joseph, Mo.), The Bluffs of the Missouri River.
Mr. Poulteney Bigelow (New York), Colonial Systems.
General Greely (Washington), Communication of Papers on different Departments of the Geographical Work of the United States Government.
Mr. A. L. Rotch (Boston), On Observations on the Upper Atmosphere.

In addition to these authors an active part was taken in the discussions of the Congress by Mr. J. Y. Buchanan, Mr. E. G. Ravenstein, Mr. B. V. Darbishire, Dr. Bryant (Philadelphia), and Mr. Steinthal.

There were no official delegates to the Congress either from countries or societies, but the president of the leading geographical society of each country, if present, was considered as in a special sense representing that country. The whole proceedings of the Congress were simplified by abandoning many of the formalities formerly considered necessary; but, as in previous congresses, formal resolutions were

passed embodying the results of the deliberations, and suggesting directions in which progress can be made. The following is a list of the resolutions passed as distributed at the concluding meeting of the Congress. In addition to those mentioned, some committees of specialists were appointed for particular subjects. The resolutions are arranged according to the departments of geography with which they deal.

RESOLUTIONS OF THE SEVENTH INTERNATIONAL CONGRESS.

International Cartographic Association.—The Congress looks upon the foundation of an International Cartographic Association as desirable, and appoints a committee to undertake preliminary arrangements.

Map of the World on the scale 1 : 1,000,000.—The Congress considers that a uniform map of the world, on a scale of 1 : 1,000,000, would be useful and desirable, each sheet of the map being bounded by meridians and parallels. The permanent bureau of the Congress is charged with taking preliminary steps for the construction of such a map, and first of all with the production of a projection, showing the lines of latitude and longitude on the proper scale for the various sheets.

Population Maps.—The Congress considers the construction of statistical population maps to be extremely desirable. It nominates an international committee, with the right of adding to its number, charged with laying down the fundamental rules for such maps, and to communicate with the geographers of different countries with the view of securing the establishment of national committees, which should take in hand the production of such maps.

Data for the Construction of Maps.—The Congress desires that the publication of all new geographical material should be accompanied by particulars as to the method of surveying, the instruments employed, and their verification, the calculation of astronomical positions with their probable errors, and the method of utilizing these data in the construction of the maps. Also that the maps issued by scientific men, or by official or private geographical institutions, should be accompanied by notes stating at least the chief data used in constructing the maps, and indicating the parts of the maps which are based on more or less satisfactory material.

Natural Scale for Maps.—The Congress expresses an urgent wish that all maps and charts—even those issued in countries using English or Russian measures—should bear in addition to the graphic scale the statement of the linear scale in the form of the ratio between the map and the region it represents (*e.g.* 1 : 500,000); and that this natural scale be quoted in all catalogues of maps. The bureau of the Congress is charged with bringing this resolution to the knowledge of the various governments.

Antarctic Exploration.—Having considered the division of the work of the approaching antarctic expeditions as described in the reports

which have been submitted, the Congress considers that a satisfactory method of international co-operation has been arrived at with regard to physico-geographical, geological, geodetic, and biological investigations. With regard to meteorological and magnetic work, the Congress feels that it is desirable to arrive at a closer agreement, and nominates an international committee with the object, (1) of determining the scope and methods of investigation of the magnetic and meteorological observations to be carried out by the expeditions themselves, and (2) of organizing a series of simultaneous and inter-communicated observations at points favourably situated outside the antarctic region.

Observations on Drift-ice.—Recognizing the importance of knowing the yearly variations in the extent, form, and amount of drift-ice, the Congress urgently appeals to the hydrographic and meteorological institutions of all countries whose maritime commerce traverses regions where drift-ice occurs, to institute international observations, and unify the results by communicating them to a central office. The Danish Meteorological Institute in Copenhagen is indicated as the most appropriate centre for collecting data as to ice in the northern seas. The Congress, therefore, appeals to other similar institutes, (1) to induce the masters of vessels to undertake observations on drift-ice; (2) to provide ship-masters with special forms for recording observations as supplied by the Danish Meteorological Institute; (3) to urge on the ship-masters the importance of filling up these forms and posting them at the first opportunity, either direct to Copenhagen, or through the corresponding institution in their own country.

Terminology and Nomenclature of Sub-oceanic Relief.—The Congress nominates an international committee on the nomenclature of sub-oceanic relief, charged with the preparation of a bathymetrical map of the oceans in accordance with the purpose of the committee. The map to be published not later than the meeting of the next Congress.

Uniformity in Measures.—The Congress expresses the hope that a uniform system of measures will be used in all geographical researches and discussions, and recommends that the metric system of weights and measures be so employed.

Uniformity in Thermometer Scales.—The Congress expresses the hope that in scientific publications the thermometric graduation of Celsius should be employed, or at least that the equivalents on the Celsius scale be added to the figures published according to the Fahrenheit and Réaumur systems.

Decimal Division of Time and Angles.—The Congress considers it desirable to retain the present system of the division of time, as well as that of the circle, into 360°, but admits that the possibility of a new system of dividing angles may be further studied. It offers no objection to the decimal subdivision of the degree when that appears to be useful.

International Seismological Observations.—The Congress declares itself favourable to the establishment of an international seismological society, and appoints a permanent committee for international earthquake study.

Phyto-geographical Terminology.—The Congress appoints a preliminary committee of biogeographers, resident in or near Berlin, charged with the working out on the simplest system possible of a uniform nomenclature of plant-formations, the preliminary scheme to be submitted to German and foreign specialists, and the finally corrected result to be laid before the next Congress.

Nomenclature of Oceanic Islands.—The Congress expresses the opinions, (1) that native names should be preserved even amongst the Pacific islands, where the names will have to be investigated with great care; (2) where there are no native names, or where they cannot be determined with certainty, the names given by the first discoverer should be employed until further notice; (3) the arbitrary change of historical names which have been long in use, and are universally known and accepted in scientific writings, is viewed both as impious and as confusing to science and commerce, and the practice should be opposed by every means; (4) incorrect and arbitrarily formed names ought to be discarded in favour of native names, or at least of names the use of which may be justified.

Population of Unorganized Countries.—The Congress recognizes the desirability of obtaining the data for a more exact estimate than now exists of the population of countries in which there are no means of taking a regular census, and instructs the Permanent Bureau to bring the matter to the notice of such governments as have foreign possessions, either directly or through the medium of geographical societies. In doing so attention should be drawn to the scheme proposed by Dr. Kiaer of the Norwegian Statistical Bureau, and the Permanent Bureau might also communicate with the committee on the subject appointed by the International Statistical Congress held in Christiania.

International Geographical Bibliography.—The Congress is of opinion that the *Bibliotheca Geographica*, published annually by the Berlin Geographical Society, should be accepted as realizing in a thoroughly satisfactory manner the requirements of an international bibliography of geography.

The Lost Leichhardt Expedition.—The German consul in Sydney having announced that an expedition is being organized in the Australian colonies with the sole object of seeking for the remains of Dr. Leichhardt's expedition, which was lost in the interior of Australia fifty-two years ago, the Congress, meeting in the immediate neighbourhood of the birthplace of the unfortunate explorer, takes the opportunity of expressing its sympathy with the aims of the proposed search expedition, and wishing it a successful result.

GEOGRAPHY AT THE BRITISH ASSOCIATION, DOVER, 1899.

The object of holding the meeting of the British Association this year at Dover was mainly to seize the opportunity of imparting to it a quasi-international character, by fraternizing with the French Association, which met at the same time at Boulogne. As regards the Geographical Section, the intention failed of its purpose, for no member of the French Association visited the section-room. The work of the section was heavily handicapped, and the audiences reduced far below the average of recent years, by the unfortunate situation and nature of the hall provided for its meetings. The work, however, was carried on with considerable energy, and some of the discussions were of real value.

The officials of the section were as follows:—

President: Sir John Murray, K.C.B., F.R.S. *Vice-Presidents:* Colonel G. Earl Church; Major L. Darwin, Sec. R.G.S.; Sir John Farquharson, K.C.B.; Sir Joseph Hooker, K.C.S.I.; Ll. W. Longstaff; Admiral Sir Erasmus Ommanney. *Secretaries:* H. N. Dickson and Hugh Robert Mill, D.SC. (Recorder). *Committee:* Colonel F. Bailey; J. Y. Buchanan, F.R.S.; Vaughan Cornish; H. T. Crook; Prof. R. A. Gregory; Dr. J. Scott Keltie; George R. M. Murray, F.R.S.; Staff-Com. Dubois Phillips, R.N.; B. Leigh Smith; Eli Sowerbutts; G. J. Symons, F.R.S.; Coutts Trotter.

Meetings of the section were held on five days, and twenty-six papers were read. A condensed diary of the proceedings will serve to show the character of the work submitted.

Thursday, September 14.—Sir John Murray read his presidental address, which was printed in full in the *Journal* for October.

Admiral Makaroff, of the Imperial Russian Navy, gave a most interesting account of the trial trip of the great ice-breaking steamer *Yermak*, in the polar pack north of Spitsbergen. He found that the steamer was able to make her way through ice having a thickness of as much as 14 feet, and he believed that vessels of this type had a great future before them in polar exploration. The powerful winches and derricks, with which the ship was provided, enabled large masses of ice to be turned over for the examination of the effects of water on the lower surface, and to be hoisted on deck for experiments as to the internal temperature and the effects of gradual melting.

A paper by Prof. J. Milne, F.R.S., was read, in the absence of the author, its subject being "Seismology in Relation to the Interior of the Earth."

Mr. W. S. Bruce, who had just returned from a cruise on the Prince of Monaco's yacht *Princesse Alice* to Spitsbergen, gave a short account of the oceanographical observations which he had carried out during several recent years on different parts of the Barents sea.

The eighth report of the Committee on the Climate of Tropical

Africa, drawn up by Mr. E. G. Ravenstein, was read, and the copy of observations and notes from a large number of stations was laid on the table. The report is as follows:—

Meteorological returns have reached your committee, in the course of last year, from forty stations in Africa.

Niger Territories.—One year's observations from Old Calabar have been received from Mr. E. G. Fenton, the medical officer. We regret that no information respecting the interior of the country has become available.

British Central Africa.—The scientific department, under the zealous direction of Mr. J. McClounie, is now in full working order, and full reports have been received for two stations of the second order, namely, Zomba on the highland, and Fort Johnston on the lake level, as also reports, more or less complete, from twenty-two other stations. Mr. McClounie hopes to be able, in the course of the present year, to equip two more stations of the second order, namely, Chinde on the coast, and another station on the lake. He has attempted to make two-hourly observations on term days, but as the exposure in the morning air resulted in fever, he has given up the attempt.

We have, in addition, received three years' registers for Lauderdale, from our most faithful correspondent, Mr. John W. Moir, as also fifteen months' record from Kambola, a station of the London Missionary Society, near the southern extremity of Tanganyika. The observer at the latter place is Dr. James F. Mackay.

British East Africa.—Returns from eight Government stations have been received. These returns are, of course, most welcome, and they speak well for the zeal of Mr. Craufurd and the officers working under him; but considering the practical importance of meteorological work, it is much to be desired that something more should be done. Let us hope that the satisfactory working of a "Scientific Department" in the South African Protectorate may induce the authorities to organize a similar institution for East Africa and Uganda. As a proof of the high value placed upon work of this kind in the neighbouring German Protectorate, we may state that a professional meteorologist has been appointed as inspector, and that there are now at work twenty-six stations, including two of the first and seven of the second order.

We are likewise in receipt of rainfall observations made by the Rev. R. M. Ormerod at Golbanti, on the Tana river.

The Old Scottish Missionary Station at Kibwezi has been abandoned, and the missionaries have removed to a new station in Kikuyu, whence three months' observations have already been forwarded.

Uganda.—The valuable observations on the level of the Victoria Nyanza have been resumed since the suppression of the mutiny.

Mr. C. W. Hobley has forwarded two years' record of the rainfall at Mumia's, the headquarter station at Kavirondo.

Our earth thermometer has accompanied Captain Austin during his journey to Lake Rudolf, but no record of work done has hitherto been received.

Friday, September 15.—Dr. H. R. Mill read some notes on the voyage of Sir George Newnes's polar yacht *Southern Cross* from Hobart to Cape Adare with Mr. Borchgrevinck's expedition on board.

M. Arçtowski gave a short account of the voyage of the *Belgica*, and laid down the following suggestions for further antarctic exploration:—

"At the present day it is impossible to consider the land alone; the whole antarctic area exhibits phenomena which remain very imperfectly known. I refer specially to the great questions of atmospheric circulation, climate, circumpolar oceanography, and magnetic conditions. Hence antarctic expeditions must be conducted in three ways—

"1. A system of fixed stations arranged between the edge of the continent and the zone of ice. These stations should be supplied with all necessary magnetic and meteorological instruments, and continue at work simultaneously for one year at least.

"2. During the same year two polar expeditions should set out on opposite sides towards the south pole. This would involve two vessels strong enough to withstand the pack and equipped for wintering.

"3. Finally, a circumpolar expedition, planned to follow the edge of the pack right round, and specially equipped for oceanographical and zoological work. This expedition would also survey the accessible parts of the antarctic coast.

"Such a system of exploration must necessarily be the work of several nations. Weyprecht's idea should be revived and followed. Antarctic exploration must be conducted systematically, and it ought to be international. A series of circumpolar stations, where comparable and simultaneous observations are carried on, would make the results of the British and German antarctic expeditions remarkably complete, and vastly enhance their value. I should suggest the following arrangement of stations. A polygon of stations should unite South America and the antarctic lands. The path of the cyclonic storms passes to the south of Cape Horn, and—at least, during part of the year—to the north of Palmer Land. The polygon should include stations on the east and west coasts of Graham Land and one of the South Shetland islands, on South Orkney and on one of the Sandwich islands, together with stations at Cape Pillar, Cape Virgins, Cape Horn, Staten island, and the Falklands. With such a system excellent observations could be made on the cyclones, which seem to travel in the general direction of the upper winds from west to east, and to follow the outline of Alexander, Graham, and Palmer Lands. Between South America and the antarctic land there is a belt of low pressure, which seems to encircle the antarctic region where there is apparently a permanent anticyclone; but observations are wanting to determine the associated conditions of atmospheric circulation. It seems scarcely necessary to insist on the advantages which two other polygons of stations would present, one to the south of the Indian ocean, the other between New Zealand and Victoria Land. The second polygon would be formed by the islands of Prince Edward, Crozet, Kerguelen, and a station on Enderby Land. The third polygon would include the Balleny, Macquarie, and Auckland islands. This would be a particularly interesting polygon on account of its comparative proximity to the magnetic pole.

"The two vessels designed to winter in the pack should approach along the meridians of 145° W. and 35° E. Imprisoned in the pack, as the *Belgica* was, these vessels would be able to carry on oceanographical and zoological work, and also to collect magnetic and meteorological observations, thus adding two stations near the pole to the various polygons. From the meteorological point of view it would be extremely interesting for these vessels to reach high latitudes, for the region near the pole will probably differ greatly from the northern edge of the antarctic lands in everything regarding atmospheric pressure, wind, and storms.

"As to the circumpolar expeditions, I think that the vessel intended for this purpose should be quite independent of those which penetrate the pack. The region is too great to admit of the whole voyage being completed in one season—three would probably be necessary."

Mr. J. Y. Buchanan, F.R.S., gave an account of the chemical and physical work to be undertaken on an antarctic expedition. The paper is given in full in the present number of the *Journal*.

Mr. George Murray, F.R.S., spoke of the botanical work which should be undertaken on an antarctic expedition, and incidentally referred to the probable cost of ships and equipment for a scientific voyage in the far south.

A discussion on antarctic exploration followed the reading of these papers. Prof. Rücker, Secretary of the Royal Society, said that what he desired as a magnetician was not so much a series of very elaborate observations at fixed stations as a general magnetic survey round the whole region on a simple scale carried out from a wooden ship. Of course, it would be best if it were found possible to combine fixed stations and a cruising survey.

Major Darwin said that two principles ought to guide all the plans for antarctic exploration—(1) if a ship is specially built for navigating the ice-laden antarctic waters, she should spend the whole of her available time in those waters; (2) the greatest unknown factor should be attacked—this was undoubtedly the antarctic continent, the exploration of which ought to be undertaken deliberately and thoroughly.

Dr. Koettlitz, surgeon to the Jackson-Harmsworth expedition, laid stress on the absolute necessity of expert supervision in the preparation of all preserved foods for an antarctic expedition.

Dr. H. O. Forbes read the report of the committee on the exploration of Sokotra, describing his recent visit to that island.

Mrs. W. R. Rickmers gave an account of the recent journey which she made with her husband to East Bokhara, and exhibited a series of particularly fine lantern slides of the scenery of the region.

Mr. O. H. Howarth read a paper on a journey in Western Oaxaca, Mexico, an abstract of which will appear in the *Journal*.

Dr. G. Schott gave an account of the meteorology and oceanography of

the *Valdivia* expedition, the main outlines of which were published in the *Journal* for June, vol. xiii. p. 640; and he illustrated the paper by some remarkable photographs of Bouvet island and of antarctic icebergs.

Mr. H. N. Dickson discussed the temperature of the sea round the British coasts in relation to the temperature of the air.

Monday, September 18.—Sir John Murray and Mr. F. P. Pullar described the work they are engaged in on the Scottish fresh-water lakes, the systematic sounding of which they have undertaken. The sounding-machine devised by Mr. Pullar was exhibited and its action explained, and bathymetrical maps of a number of the lochs were shown.

Sir John Murray and Mr. Irvine submitted a paper, entitled "The Distribution of Nitrogen and Ammonia in Ocean Water."

Mr. H. N. Dickson described the present state of his elaborate research on the temperature and salinity of the surface-water of the North Atlantic during 1896 and 1897.

Dr. H. R. Mill put forward a tentative scheme for a terminology of the forms of suboceanic relief. He said—

"It is obvious that there are two great classes of forms, elevations above and depressions below the general level of the ocean floor; but the question is how many subdivisions of each can be recognized as distinctive and deserving of generic names. I am inclined to put forward tentatively the following general scheme of terminology, premising that no attempt be made to localize any precise type of form unless a considerable number of soundings exists to define it:—

"*Depression.*—The general term for any hollow of the ocean floor.

"*Basin.*—A relatively wide depression, with comparatively gently sloping sides.

"*Caldron.*—A relatively wide depression, with comparatively steeply sloping sides.

"*Furrow.*—A relatively narrow depression, with comparatively gently sloping sides.

"*Trough.*—A relatively narrow depression, with comparatively steeply sloping sides.

"*Wall.*—Any submarine slope comparable in steepness to a precipice on land.

"*Floor.*—Any very gentle submarine slope or nearly level surface.

"*Elevation.*—Any inequality above the general level of the ocean floor.

"*Rise.*—A relatively narrow elevation.

"*Bank.*—A relatively wide elevation.

"*Shoal.*—An elevation coming within 5 fathoms of the surface, so as to be a danger to shipping.

"*Shelf.*—A nearly horizontal bank attached to the land and bordered seaward by a much more abrupt downward slope."

Sir John Farquharson, late Director-General of the Ordnance Survey, gave a most comprehensive account of the work of the national survey during the last twelve years, which will be submitted to the Royal Geographical Society in an ampler form, accompanied by a carefully selected collection of British and foreign maps, during the current session. The work of the survey was criticized by Mr. H. T. Crook, who was replied to by Sir John Farquharson and by Colonel Johnston, the Director-General of the Survey.

Mr. Vaughan Cornish read a paper on the sand-dunes surrounding the delta of the Nile, comparing them with the small sand-dunes he had previously studied on the south coast of England, and explaining their size and grouping by reference to the direction of the prevailing wind and the distribution of moisture in the soil.

Tuesday, September 19, 1899.—Tuesday was devoted mainly to travel papers. Dr. A. C. Haddon, F.R.S., under the title of "Anthropogeographical Notes on New Guinea and Sarawak," treated some of his observations during the recent Cambridge anthropological expedition in their geographical bearings, showing how the occupations and manner of life of the primitive peoples he had been studying were direct consequences of their geographical environment.

Mr. W. R. Rickmers described his journey in the Karch-Chal mountains of Transcaucasia, a fuller account of which will be presented to the Society.

Captain Wellby gave a fascinating account of his recent journey through the borders of Abyssinia, a fuller report of which will be presented to the Royal Geographical Society.

Mr. Walter Wellman gave some notes on his unsuccessful expedition to Franz Josef Land.

Mr. C. W. Andrews read an interesting paper on Christmas island in relation to the neighbouring lands, in which he drew attention to the extraordinary biological puzzles presented by the island, not the least of which is the presence of a true earthworm, a form of life never previously detected on so remote an oceanic iceland.

A paper on the date of the discovery of Australia by Mr. E. Heawood was communicated in the absence of the author.

Almost all the papers in the course of the meetings of the section were illustrated by lantern views, and the local committee at Dover deserve special thanks for the admirable arrangements they made for the provision of a first-rate lantern and a skilful operator.

ON THE PHYSICAL AND CHEMICAL WORK OF AN ANTARCTIC EXPEDITION.*

By J. Y. BUCHANAN, F.R.S.

After the communications which have just been made to the section, there seems to remain very little to be said on the subject of the fitting out of an antarctic expedition. The problem is solved, and it is a matter for hearty congratulation that before the close of the century the British Association should have received the account of the first wintering ever effected by human beings within the antarctic circle, and the preliminary report of the successful landing and establishment of the first party to spend the winter on land within the same circle. We know how both expeditions have been fitted out, how they have been composed, and it can easily be ascertained what they cost.

The party, consisting of seven scientific men, at present wintering at Cape Adair, are placed in the distinguished position of being able to furnish the first report of the winter conditions on antarctic land by the liberality and public spirit of one man, Sir George Newnes, and nothing can prevent his being the first to furnish authentic information about this dark continent throughout a whole year. For this he deserves the thanks of the scientific world.

The communication of Dr. Arçtowski, illustrated by the very beautiful slides which he has shown to us, shows the possibility of doing good work in safety while enclosed in the southern pack. We have thus a marine antarctic expedition which has been completed and shows splendid work, and a land expedition established which cannot fail in a few months to show an equally good record. It only remains for us to follow one or other example or both.

The photographs with which Dr. Arçtowski has illustrated his paper are of great geographical interest. The pictures of the ice, and especially of the mountains and glaciers of the islands visited, show, as he has himself pointed out, a distinctly arctic *facies*, which seems to be characteristic of the region west of the meridian of Cape Horn. The icebergs are comparatively small and irregular in shape, as they are in the north, and they are in striking contrast to the enormous tabular bergs met with east of that meridian, which are always regarded as the typical antarctic form of iceberg. Further, the photographs of the mountains and the glaciers from which these bergs spring recall Spitsbergen, though they seem to be grander; and the idea immediately crossed my mind that we have here a new and inexhaustible field for the activity of the Alpine climber. The Swiss mountains are nearly played out, and nothing now is left to be done except to ascend old summits by new and more dangerous routes. In the grim solitudes photographed by Dr. Arçtowski, the successful climber will be rewarded for his hardships by the fame of the discoverer. For the student of ice, the photographs by Dr. Arçtowski are of great value, and it is to be hoped that his report will illustrate and interpret them, and that no detail will be omitted which can throw light on the physical conditions of the ice of all kinds met with by him during his sojourn on the *Belgica*.

Having borne my testimony to the scientific importance and value of the marine expedition which has returned, and by anticipation to that of the land expedition which is now at work, I find it a little difficult to say anything that will be interesting on the subject of the chemical and physical work of our antarctic expedition. The work of the chemist and physicist of a marine expedition is well

* Paper read at the Dover meeting of the British Association, September, 1899.

known, and I do not propose to take up the time of this section by repeating it. One or two useful suggestions, however, may be made. If one of the ships fitted out by this country follows the route which I am most inclined to favour, namely, from the Falkland islands southwards, the marine work will join directly on to that of the *Challenger*. One of the striking features of the ocean discovered by that expedition was the extensive area of very cold water which occupies the bottom of the sea from the east coast of South America to the ridge which runs north and south in the meridian of the island of Ascension. Here the bottom temperature was found to be 32°·5 Fahr. The existence of this exceptionally cold bottom water was discovered on the outward voyage in soundings near the Brazilian coast, so that the expedition was prepared to take up the study of it on its way home. This was done very thoroughly on a line from the mouth of the river Plate along the parallel of 35° to the meridian of Ascension. The depth of the water varied from 1900 to 2900 fathoms, and the distribution of temperature in the water was, roughly, a warm surface layer of perhaps 100 to 200 fathoms, then a thick layer of water of temperature about 36° Fahr. down to 1600 fathoms near the coast, and to 2200 fathoms or thereabout out at sea. Here was a steep temperature-gradient falling away rapidly from 35° to 33° Fahr., and more slowly to 32°·5 Fahr. The occurrence of the steep gradient shows a renewal of the water, and therefore a current. The observations of the *Valdivia* show a similar distribution in lat. 60° to 63° S., with this difference—that the surface layer is colder than the intermediate one, which is also somewhat colder, being about 34° Fahr. The bottom layer has as low a temperature as 31°·5 Fahr. Unfortunately, there are not enough determinations of the temperature of the deeper layers to indicate the gradient which separates the cold bottom water from the comparatively warm intermediate water. The recommendation, therefore, which I would make is, that in these regions temperature observations in the deeper layers should not be spared, and where there is water of exceptional coldness at the bottom, the position and steepness of the gradient which separates it from the overlying water should be accurately determined. Further, as the whole range of temperature to be dealt with in antarctic water is at the most from 28° to 35° or 36° Fahr., and therefore small differences of temperature are relatively of great importance, it is well to have the thermometers constructed specially for this work, the scale containing few degrees, but these wide apart. In the survey of the Gulf of Guinea in the *Buccaneer*, I had such thermometers, and I regularly sounded with a thermometer at the end of the wire, and another usually 250 fathoms above it.

It is also of great importance to ascertain the density of this exceptionally cold bottom water. Near the coast of South America it was found in the *Challenger* to be very high, and this was confirmed by an observation of the *Gazelle* in the same locality. It is this density at constant temperature which decides whether a water can carry its surface temperature down to great depths, or whether it shall remain at the surface, and it is the annual range of temperature of such water which gives it its penetrating power. This was clearly set forth in a paper sent home during the first year of the voyage of the *Challenger*, and published in the *Proceedings of the Royal Society*.* The highest surface densities are found in the North Atlantic, in the Trade wind regions, and there the surface water has a higher density than any layer below it; consequently, when it is cooled in winter to the same temperature as the water immediately below it, it sinks through it, and in this way a high temperature is disseminated through the whole thickness of the water of the North

* "Note on the Vertical Distribution of Temperature in the Ocean," by J. Y. Buchanan. *Proc. R.S.*, 1874, vol. 23, p. 123.

Atlantic. In the eastern part of this ocean the density and temperature of the bottom waters are sensibly increased by the "brining down" of the Mediterranean.

The determination of the atmospheric gases dissolved in the sea-water is an important piece of routine work for the chemist when at sea, and no opportunity should be missed of extracting and analyzing them from waters of all depths. The variation in the quantity of oxygen dissolved is an indication of the extent to which the dissolved air has been used in the support of life. There are titrimetric methods for the determination of this factor, which enable the oxygen alone to be determined in many more samples of water than can be overtaken when the gases have to be boiled out and collected before being analyzed. But this operation should not be neglected, as it is only by actually extracting the gases and analyzing them that we can obtain the absolute amount of nitrogen present, and it has important bearings on the temperature, which the water, if from the bottom or from intermediate depths, had when it was exposed to the atmosphere at the surface. There are many forms of apparatus which enable this to be done satisfactorily. The apparatus used in the *Challenger*, which was communicated to me by Dr. Jacobsen when the *Pomerania* visited Leith in 1872, acts very well in competent hands. I have since improved it by using a hand air-pump, fixed to the table, to do the work of making the vacuum. The subsidiary bulb, which in the original apparatus held the water, which had to be kept boiling continuously for ten minutes in order to eliminate the air, is made vertical and like a 50 c.c. pipette. It is graduated, and when slightly warmed after exhausting with the air-pump, sufficient steam is generated to guarantee that the pump removes the last traces of air before the upper end of the gas-tube is sealed. When the operation is finished, the residual air in the subsidiary bulb can be easily and accurately measured. The addition of the air-pump makes it possible to get through a great deal more work than was possible when the vacuum had to be made by boiling water.

If the route which I have suggested be followed, the ship will come into the neighbourhood of Weddell's furthest south, in lat. 74° 20′ S., long. 33° W., and of Ross's remarkable sounding of over 4000 fathoms with no bottom in lat. 68° 30′ S. and long. 12° 30′ W. I have always regarded this sounding as authentic, because Sir James Ross was as capable of making correct soundings in deep water as any surveying captain of the present day. The numerous soundings of 3000 fathoms and over which have been made in the *Valdivia* about midway between the route of the *Challenger* and Ross's sounding, must help to convince those who have regarded Ross's sounding with suspicion. The common feature of antarctic water found by all expeditions is the thick warm layer above described, lying between a cold layer at the surface and another cold layer at the bottom. It is very important to trace these two cold layers southwards until they join, and the warm intermediate layer has disappeared. Every particular connected with this will be of interest.

Sir James Ross, in his description of his voyage, frequently refers to 39° Fahr. as the temperature of maximum density of all waters, and draws curious conclusions. Now, it was well known before the date of his voyage that average sea-water continues to contract to a much lower temperature than 39°. Indeed, its temperature of maximum density is below that of its freezing-point, which may be put at 29° Fahr. A similar mistake is often made at the present day by geographical writers. Although everybody knows and recognizes that sea-water freezes at a temperature below that of fresh water, and that this temperature is the lower the greater the quantity of salt contained in the sea-water, it is to

some extent not known and to a great extent not recognized that pure ice, which when left to itself melts at 32° Fahr., begins to melt in salt water at exactly the same temperature as that at which the same water begins to freeze. A piece of pure lake-ice immersed in average sea-water reduces its own temperature and that of the sea-water in its immediate neighbourhood to a temperature of roughly 29° Fahr., which varies with the concentration of the resultant brine formed by the mixture of the sea-water with the pure water formed by the melting of the ice. An iceberg consists of pure land-ice, and if it is of sufficient thickness to reach the layer of warm intermediate water, its lower surface must be always melting at a temperature of about 29° Fahr., and this temperature must in time be communicated to the body of the ice if it did not have it before. But it must necessarily be at about this temperature, because it separates from the parent land-ice after it has been pushed into the sea. If it had a temperature below 29° Fahr., it would freeze the sea-water round it until it had got rid of its excessive cold; and if it had a temperature above 29° Fahr., the sea-water round it would melt its ice until it had got rid of its excessive heat. 29° Fahr. is taken as the representative freezing temperature of sea-water, but it varies with the salinity. In this respect sea-water was found to agree closely with a solution of chloride of sodium containing the same percentage of chlorine. The subject was carefully investigated during the winter 1886–87, and the results were communicated to the Royal Society of Edinburgh, in a paper which was read on March 21, 1887.* The rule regulating the appearance or disappearance of ice in a solution of chloride of sodium is very simple. The number expressing the percentage by weight of chlorine in the solution expresses on Celsius' scale the depression of the freezing-point of the solution below that of distilled water, and by consequence the temperature at which pure ice begins to melt in the same solution. Thus the freezing-point of a solution of chloride of sodium containing 1 per cent. of chlorine is $-1^{\circ}\cdot0$ C.; if it contains 1·75 per cent. chlorine, its freezing-point is $-1^{\circ}\cdot75$ C.; and so on for concentrations not exceeding that of the saltest ocean water. Sea-water, the solid contents of which consist chiefly of chlorides, follows this rule approximately, but not exactly. The following table, from p. 133 of the memoir, is derived from twenty-five determinations made with the greatest care in sea-waters of different degrees of concentration and freezing at temperatures between $-0\cdot5^{\circ}$ C. and $-2^{\circ}\cdot22$ C. :—

Freezing temperature	$-2^{\circ}\cdot0$ C.	$-1^{\circ}\cdot5$ C.	$-1^{\circ}\cdot0$ C.	$-0^{\circ}\cdot5$ C.
Per cent. by weight of chlorine ...	1·940	1·445	0·963	0·475
Difference	0·060	0·055	0·037	0·025

From this we have the following approximate rule: the number expressing on Celsius' scale the depression of the freezing-point of a sea-water below that of distilled water is found by adding 0·04 to the number expressing the percentage by weight of chlorine in the same water. From these few remarks, it will be seen that the mutual interaction between ice, salt, and water must be taken into account in interpreting the results of the sea-temperatures of the antarctic.

If ice is an important feature of the sea in antarctic regions, it is a still more important feature of the land, and it should be the object of careful observation by the landing-party. In the short time at his disposal, Dr. Arçtowski has not been able to tell us much about its structure or other particulars, but we may confidently look forward to the detailed report of his work in the *Belgica* for much

* "On Ice and Brines," by J. Y. Buchanan (1887). *Proc. R.S.E.*, vol. xiv. p. 129; also *Nature* (1887), vol. xxxv. pp. 516, 608, and vol. xxxvi. p. 9.

that cannot fail to interest the student of ice. The subject is a large one. The longer one studies ice the more one finds there is to learn about it, and the physicist or chemist who takes part in the expedition should miss no opportunity of studying it in all directions. In order to do so with effect, he ought to have made preliminary studies of glaciers in Switzerland, where he finds every facility to his hand, and these studies should be made in winter as well as in summer. It is of little use to send a man to study the peculiarities of antarctic ice if he has not made himself acquainted with all that is to be learned about European ice. The time of the expedition should not be wasted in learning elementary matters. I felt this myself when the *Challenger* was in antarctic waters. I had been in Switzerland; I had been on glaciers and in glaciers; I was familiar with the literature about pressure and fusion and regelation, but it was all of no use when the ice, which was brought down from a large berg by a shot, was brought on board: I had never studied ice, and could form no opinion whether it was the same as Swiss glacier ice, or, if it was different, how it differed; and there was nobody on board who knew any more than I did.

Another educational preliminary for the members of a land expedition is to acquire as much skill as possible in ski running and the method of travel adopted by Nansen in crossing Greenland. For this purpose a short visit to Norway in winter would be useful. The way into the interior will almost certainly be over land ice, and if it is the ice which is the parent of the great tabular bergs so well known from illustrations, it is probable that travelling over it will not be very difficult in so far as the nature of its surface is concerned. It is probable that landing will only be effected in localities like Cape Adare, where a shoulder comes out from the main mountain ridge and reaches the sea, forming a promontory. From want of support seaward the land ice falls away on either side from the ridge, or *arrête*, leaving the rock bare except for fresh snow. Such a bare ridge will afford the indispensable fixed foundation for observations on the motion of the neighbouring glacier, and means should be taken to set lines of stones or other marks and fix their position before the darkness of winter sets in. It has long been known that the glaciers of Greenland travel much more rapidly than those of Switzerland, but it is only since the publication of * v. Drygalski's remarkable observations, carried on throughout the year on the glaciers of the west coast of Greenland, that we know that in some cases the motion of the ice reaches the astonishing rate of 18 metres in twenty-four hours, and that this rate of motion is very little affected by the change of season. According to Drygalski, what chiefly affects the motion of a glacier is its mass. Great as are the glaciers of Greenland, there can be little doubt that the parents of the antarctic tabular icebergs are many times greater, and it is not inconceivable that at this moment Sir George Newnes' observers may be enjoying the extraordinary spectacle of a glacier advancing as visibly as the stream of a sluggish river. If conditions such as these exist on the antarctic land, it is little wonder that the supply of tabular icebergs is so abundant, and we get a new light on the amount of precipitation within the antarctic circle. Dr. Arçtowski has described how, on the occasions when he landed on the rugged coasts visited by the *Belgica*, and the weather was calm, the thunder of falling ice was continuous. On Heard island, during the short visit which I was able to pay it from the *Challenger*, the fall of ice from the western portion was also nearly continuous.

Since the days of Hugi and Agassiz, the intimate structure of glacier ice has been the object of much study by continental and chiefly Swiss naturalists.

* 'Grönland Expedition, 1891–1893, unter Leitung von Erich von Drygalski.' Berlin, 1897.

Englishmen, though they frequent glaciers as much as any other nation, have generally ignored it. Tyndall, to whom we owe so much of our knowledge about ice, recognized the existence of the *grain* of the glacier, as it is called, but made no use of it in his speculations with regard to the nature of the motion of glaciers. As his theories are independent of this fundamental feature of the constitution of glacier ice, they must be *pro tanto* incomplete. The colour of the surface of a glacier, so dazzling in its whiteness that the inexperienced beholder is apt to suppose it covered with freshly fallen snow, is due to the disintegration of the compact blue glacier ice into its constituent grains under the influence of the radiation of the sun. There is no more instructive or more beautiful experiment than to expose a block of compact blue ice taken from the interior of the glacier to the direct rays of a powerful sun. Such a block is easily obtained by penetrating into the grotto from which the glacier stream issues to such a distance that direct sky-light is shut out. Any of the blocks found there will do, and it is to be brought out and exposed on a rock. In twenty minutes or half an hour the block falls down into a heap of irregularly shaped pieces of ice, each of which is a grain and a single crystalline individual. In higher latitudes or in dull weather, the power of the sun is not sufficiently strong to effect this complete and striking dissolution, but it loosens the block into its grains, which will rattle if the block be shaken.

I have analyzed blocks of ice from many Swiss glaciers, and weighed the individual grains. They are of all weights up to a certain maximum, which varies with the glacier and the part of it furnishing the ice. The largest that I have met with was from the Aletsch glacier, and it weighed 700 grams. It is the size or weight of the largest grains that it is important to determine. Small grains are abundant in every glacier, and are a necessity in order that the larger ones may pack close. The size of the largest grains is what is referred to when we read that the grain of this glacier is large or of that one small. The shape of the grain is irregular, and no two of them are alike, but they fit into each other like a puzzle. They resemble a collection of vertebræ more than anything else. Indeed, if the disarticulated vertebræ of an animal, especially one with a long tail, were carefully packed into a box of a suitable size, so as to occupy the least possible space, the boxful of vertebræ would resemble the block of ice which has been loosened by a moderate sun, and would rattle when shaken in much the same way. If gelatine were allowed to run into the box and set, we should have a model of the block of ice before exposure to the sun. If the box of vertebræ were exposed to the sun, the gelatine would be liquefied, and the mass would be loosened as in the case of the ice. What is it in the block of ice which corresponds to the gelatine in our illustration with the vertebræ? It is the slightly impure water which surrounds the grains and in which they *float* or try to float. Under the influence of cold this impure water supplies pure ice to the grain with which it is in contact, while its freezing-point continually falls; finally its freezing-point and the temperature to which it is exposed reach a minimum, and the grain remains in contact, even in mid-winter, with a film of brine, which may be very minute. With rising temperature the grain begins to melt at the temperature at which it ceased to freeze, it dilutes the brine, and raises its own melting-point. We see, then, that the grain of the glacier may be surrounded in summer by a relatively considerable envelope of water of comparative purity and high freezing-point, while in winter it is surrounded by a mere film of brine of comparatively low freezing-point.

A ship floats in the smallest basin as perfectly as in the largest ocean. We can imagine a dock being built round a ship, and so exactly moulded to its shape, that between the inner surface of the dock and the outer surface of the ship the clearance

shall be so small that a pitcher of water poured into it will float the ship. The floating of a grain in the inside of a glacier is of this kind, and as it is enclosed on all sides, it will press against the ice above it in preference to that beneath it.

This feature of glacier ice permits us to understand how glaciers can move and begin to move even when their temperature is very low. Before von Drygalski's work on Greenland, we had no trustworthy information regarding the temperature throughout the year of the inner mass of the ice of any glacier. He carried out, at regular intervals of time, a series of observations of the temperature at different depths below the surface of one of the Greenland glaciers, and parallel observations within the ice covering a neighbouring lake. These observations showed that the temperature of the glacier increases rapidly from the surface downward, and they render it probable that the greater part of the thickness of a Greenland glacier is, even at the coldest time of the year, at or near the ordinary temperature of melting ice.* The heat required to support this temperature can only be supplied by the friction of the grains of the ice, called into being by the motion of the glacier. The *inland ice* which forms the great reservoir for the supply of the glacier, was found to have little or no appreciable motion. Series of temperatures were not taken in its thickness, but, in the absence of motion, we may believe that the very low temperature at its surface penetrates far into its interior, if not to the very bottom. If the motion were dependent only on the lowering effect of pressure on the melting-point of pure ice, it would be difficult for such a mass of ice to *start* when it arrives at an outlet. The impurity of all natural water and the effect which it has in lowering the melting point of ice at ordinary pressures remove this difficulty. However compact and solid the blue ice may look, there will always be *some* brine between its grains which will permit some yielding of its mass, which in its turn will produce a first generation of heat; this will produce a further yielding, and in due course a further generation of heat, and the effect of this initial agency, when combined with the powerful effect of fusion and regelation under conditions of very slight variation of temperature, is the extraordinary rate of motion observed in the glaciers of Greenland.

Drygalski is to be the leader of the German Antarctic Expedition, and we may be sure that he will continue the researches which he has begun so successfully in the arctic regions. Parallel observations should be made by the English observers on the land-ice with which they meet, and they will, as a matter of course, have made themselves familiar with what has been done already in this department.

It has been pointed out that the whiteness of the surface of a glacier is due to what may correctly be termed sun-burning or sun weathering. The icebergs which are met with at sea have an equally white surface, but where the interior is exposed either in crevasses or in caves worn by the waves, the deep blue colour of the fresh ice is visible. It is obvious that the whole of the surface of the glacier which is immersed in water at greater depth than that to which the sun's rays can penetrate must have the same blue colour, and it is equally obvious that when an iceberg turns completely over, it must stand out as an intensely deep blue mountain of ice among the multitude of sunburnt white ones. On one of the very fine days during the sojourn of the *Challenger* in antarctic waters, a striking and magnificent example of this was observed, but the cause of the blueness of the strange berg was quite unsuspected. If ice were collected, by bombardment or otherwise, from such a berg, the grain would be large and well developed, and the ice would be quite compact and free from vesicles. In the region visited by Dr. Arçtowski, the glaciers

* Compare Hugi, 'Ueber das Wesen der Gletscher und Winterreise in das Eismeer,' p. 51.

and the icebergs were comparatively small and of an arctic character. The distribution of snow, *névé*, and ice he describes as being similar to that in the Alps at a height of 3000 to 4000 metres. There appeared to be very little melting, yet the glaciers advanced steadily towards the sea. In the *Challenger* I observed at least one large tabular berg which was melting freely on the top, and streams cascading down the sides. In Spitsbergen the glacier streams often take large proportions; it will be interesting to know if in equally high southern latitudes there is similar melting under the influence of the long polar day.

It was my intention to say something about the meteorology of the antarctic, but when I read the account by Sir George Newnes of the blizzard which greeted his party on landing at Cape Adâre, I felt that it would be pure guessing. A temperature of $-18°$ Fahr. with a furious tempest of wind in the middle of what corresponds to our month of August, is a fact which disables prophecy. Let us hope that the winter climate will contrast less unfavourably with that in the arctic than the summer does.

It is the intention to establish observing-stations on some of the islands of the southern ocean. It is particularly to be desired that a pair of stations should be established, one near the south end of Kerguelen, in Royal sound for instance, and the other on Heard island. Kerguelen is completely in the south temperate zone, and Heard island is completely in the antarctic zone, and is glaciated from summit to sea-level, and they are only 180 miles apart.

I have nothing further to say about the work of a physicist and chemist on an antarctic expedition. He will be selected for his efficiency, and he must keep his science and his art handy for use when occasion may arise.

THE OXFORD SCHOOL OF GEOGRAPHY.

Some information concerning the Oxford School of Geography was given in the July number of the *Journal*. The following is a more detailed statement of the programme issued by the Committee:—

Staff.—Reader in Geography: H. J. Mackinder, M.A., student of Christ Church.

Assistant to the Reader: Andrew J. Herbertson, PH.D.

Lecturer in Physical Geography: H. N. Dickson, F.R.S.E., New College.

Lecturer on Ancient Geography for 1899–1900: G. B. Grundy, M.A., Brasenose College.

Courses of Study.—The Committee have under consideration a comprehensive scheme of theoretical and practical instruction in Geography, the details of which will be published during the Michaelmas Term. The full course will probably extend over one academic year.

The following arrangements have been made for the Michaelmas Term. The lectures and practical instruction during this term will form part of the complete course for the first year.

The Reader in Geography (Mr. Mackinder) will lecture twice weekly on "The Historical Geography of the British Isles," commencing in the first week of November.

The Lecturer in Physical Geography (Mr. Dickson) will lecture twice weekly on "The Climate of the British Isles," on Mondays and Thursdays, at 11 a.m.

The Assistant to the Reader (Dr. Herbertson) will lecture once a week on "The Geomorphology of Europe," on Tuesdays, at 11 a.m.

The Lecturer in Ancient Geography (Mr. Grundy) will lecture once a week on "The General Historical Topography of Greece," on Fridays, at 5.30 p.m.

The laboratory will be open daily (except Saturdays) from 10 to 4. The Assistant to the Reader will give instruction in cartography and practical geography, with field work: during the Michaelmas Term special attention will be given to the study of map projections, and of physical maps of all kinds. At least one hour a week will be devoted to the discussion of recent geographical literature.

The lecture-room and laboratory are on the upper floor of the Old Ashmolean Museum, Broad Street.

Fees.—Members of the University free to lectures; £2 a term for Reader's class, £3 a term for Assistant's classes.

Persons not members of the University, 10*s*. for each course of lectures, in addition to the above class fees; for full course, £21 a year.

All communications with reference to the school should be addressed to H. J. Mackinder, Esq., Department of Geography, Old Ashmolean Museum, Broad Street, Oxford.

THE MONTHLY RECORD.

ASIA.

Central Asian History.*—In a compact volume suited to the requirements of the general reader, and equally useful as an introduction to more serious study, the authors of 'The Heart of Asia' have supplied, "for the first time in any language," to quote the words of the preface, "a consecutive history of Central Asian events from the earliest days." Considering the importance of the events of which that region has been the theatre of late years, and the practical certainty, that its future will exercise no less important influence on the history of the continent, it is alike matter of surprise that the want should not have been already supplied, and of satisfaction that this should at last have been done. The authors are qualified for the task both by personal acquaintance with the country with which they deal, and—in the case of Prof. Ross, who is principally responsible for the purely historical chapters—by a knowledge of the languages of the original authorities (Persian, Arabic, and Russian), which are utterly inaccessible to the ordinary reader. The first half of the book traces the varying fortunes of Central Asia (or rather that part of it lying between the Caspian, the Sir Darya, and the Hindu-kush) under Eastern rulers, from the early days when it formed a satrapy of the Persian empire under Darius II., to the commencement of the final struggle with Russia in the days of Mozaffar-ud-Din of Bokhara. This history of changing dynasties, while dealing with some familiar names, such as those of Chinghiz-Khan and Timur, is for the most part entirely new ground to the English reader, though others of the actors on the stage—notably the Arab leader, Kutayba ibn Muslim—deserve to be better known than they have been. Kutayba's career of conquest commenced with his triumphal entry into Merv,† as governor of Khorasan, in A.D. 705. The second half of the book is perhaps the most valuable, as chronicling the steady advance of Russia in Central Asia, and giving a clear insight into the causes of her success. The concluding chapter, in which the mutual relations of Russia and Great Britain are discussed, merits careful attention. The authors show a high appreciation of the value of the work accomplished by the Russians,

* 'The Heart of Asia.' By Francis Henry Skrine and Edward Denison Ross. London: Methuen. 1899.

† The epithet by which this city was distinguished from its less important namesake, has, it seems, been wrongly translated "Queen of the World."

who, in spite of some faults, are, they say, "a young and vigorous race, imbued with a passionate love of their country, a steadfast belief in its high destinies, both rare and precious in these days of flabby cosmopolitanism."

Lieut. Olufsen's Expedition to the Pamirs.—We learn from the *Geographische Zeitschrift* (1899, p. 410) that the Danish expedition (*Journal*, vol xiii. p. 302) left its winter quarters at Shorok on March 1, and proceeded southwards to explore the upper valleys of the Hindu-kush in that direction. It was proposed subsequently to traverse Wakhan towards the north-east, and proceed to Kashgar. Great difficulties had been experienced in obtaining porters and beasts of burden. During the winter the greater part of the Pamirs, apart from the high passes, remained free from snow. The approach of spring was announced by a severe storm towards the end of February.

Korea.—From the 'Report on the Trade and Commerce of Corea for the year 1898,' by Mr. J. N. Jordan (Foreign Office, Annual No. 2304, 1899), we note the following particulars. The two ports of Chinnampo and Mokpo that were opened on October 1, 1897, have developed a very satisfactory import trade. The trade of both these places is still carried on to a large extent through the older ports of Fusan and Chemulpo. Mokpo, from its central position, will probably in a few years become a place of considerable commercial importance. It lies about 7 miles from the mouth of the Keum Sang river, on the south-west coast of Korea, and forms the outlet for the produce of the three richest provinces in the peninsula. The ports of Song Chin, Kunsan, and Masanpo, and the city of Pingyang were to be opened on May 1 of the present year. Pingyang is the city of which Chinnampo forms the treaty port, and lies 40 miles further up the river. Of the three new treaty ports Kunsan is pointed out as the most promising. Situated in lat. 36° and long. 126° 43′, it lies a little more than halfway between Chemulpo and Mokpo, near the mouth of a river, which drains a rich rice-growing section of the country. This river is navigable for large vessels as far as Kanggenni, 30 miles distant from Kunsan, while smaller crafts can ascend as far as Kung Ju, some 30 miles further up, and the capital of the adjacent province. Kunsan possesses an indifferent harbour. Masanpo, which lies about 40 miles west of Fusan, at the mouth of the Naktong river, has the advantage of inland navigation and a superior harbour to that of Fusan. Songchin, the port of Kil-chu, is situated approximately in lat. 41° and long. 129° 20′, in the extreme northern province which adjoins Russian territory. A considerable trade in cattle and piece-goods is said to be carried on between it and Vladivostock. The Söul-Chemulpo railway, the construction of which was commenced in the spring of 1897, will probably not be completed before the end of 1899. A contract has been signed for the construction of a railway between Söul and Fusan, a distance of about 300 miles, and steps are being taken to conduct the preliminary surveys. The inter-port traffic continues to grow yearly, and is likely to develop rapidly now that there is a prospect of the whole coast-line of the peninsula being rendered accessible to steam-navigation.

AFRICA.

Mr. Weatherley's Surveys in the Bangweulu Region.—We have received from Mr. Weatherley a detailed account of his latest expedition to Bangweulu, to which brief allusion was made in a previous number. The journey appears to have entailed great hardships, as Mr. Weatherley was suffering from dysentery during much of his surveying work in the marshes bordering on the lake, and it says much for his energy and determination that he persevered in his task under the circumstances. From Chita, on Lake Mweru, Mr. Weatherley proceeded south down the plateau, and, descending into the plain, made his way to the Johnston falls on the

Luapula, and thence to the north-west corner of Bangweulu. Some 10 miles north-west of the lake three considerable rivers, the Mwampanda, Lifubu, and Liposori, unite to form a vast marsh, called Kasamba, traversed during the rainy season by narrow waterways extending to the open water of the lake. The three rivers appear to enter the latter by a single waterway named Sanga. Mr. Weatherley's observations place the north end of Bangweulu in 10° 48′ 4″ S., and the exit of the Luapula at Panta point in 11° 31′ 32″ S., thus giving it a length of 43½ miles. After visiting his old camp in 1° 19′ 50″ S., he surveyed round the islands of Kirui, Kisi, and Mbawala, and measured the breadth of the channels between them. That between the last two he found to be 4 miles 1672 yards, with a depth in the centre of 15 feet, and between Kirui and Kisi 3 miles 891 yards, with a depth of 12 feet 6 inches. From Kirui he traversed the marshes *viâ* Kokoto to Nsombo, and, crossing the Ifunge peninsula (such, and not an isthmus, he now considers it), reached the lakelet Chifunawuli, which at its south end is 5400 yards across. Regaining Bangweulu, he made for the Luapula, which was reached after an anxious time, owing to the helplessness of the canoe-men. Had not the lake remained calm many men must have been lost. Gales had on this expedition been of almost daily occurrence, whereas on the former journey the water was invariably unruffled. Near Panta point the great Kavangama marsh was crossed by shallow waterways, the canoes often sticking fast in the foul deposit of decomposed vegetation, 8 to 10 feet deep. On the Luapula the difficulties increased. The *Vigilant* and canoes were dragged across the densely wooded peninsula of Kapata, which separates the Luapula from Lake Kampolombo, but in spite of all precautions two of the canoes were stolen during the following night. Kampolombo having been surveyed, the expedition recrossed to the Luapula, which was followed down for a day through an interminable papyrus marsh. After a night spent on a quaking platform of papyrus stems, further progress was found to be impossible, the river being absolutely blocked by "sudd." The current was so sluggish as to be almost imperceptible. Returning northwards, after a vain attempt to force a way west to the Kangwena lakelet, the party returned to Kampolombo. Kangwena is a round sheet of water of no great size, connected with Kampolombo by a channel called Wutuwu (or Utuwu). While crossing Kampolombo (3½ to 4 miles across) by the light of a young and watery moon, a furious storm of wind and hail arose; but the canoes all weathered it in safety, and camp was pitched on the east side of a peninsula which separates Kampolombo from Chifungwe, a narrow sheet of water abreast of the northern half of the Kampolombo. The next day the *Vigilant* was capsized by a hippopotamus, which, attacking from below, drove its tusks three times through the metal of the boat. This was patched up with old biscuit-tins, while rifles, sextant, camera, etc., were taken to pieces, cleaned and dried, but the watches and photographic films were ruined. Regarding Mr. Crawford's statement that he saw Bangweulu stretching away to the north from the south-west corner of Kampolombo, Mr. Weatherley says he might have done so by travelling 20 miles north, but not otherwise. Even on the very shore of the larger lake, north of Kampolombo, its water is invisible on account of the intervening Kavangama marsh. From Kampolombo the expedition struck overland for the Luapula, the canoes being abandoned and the *Vigilant* taken into sections. From Kafufwe, 112° 8′ 52″ S., Mr. Weatherley made a trip to Chitambo, and then began the voyage down the Luapula, following every bend (either by water or on the bank) until Mweru was reached. He was much impressed by the Mumbotuta falls, which, he says, no white man, not even Giraud, had visited. They are due to a great fault cutting the river diagonally, and the mad chaos of the foaming water—the thunder of which can be heard 8 or 9 miles on a still night—is an indescribably grand sight.

Beyond this, torrents of rain were experienced, food was scarce, and the party were occasionally shot at by the natives, but, by preserving an imperturbable demeanour and refusing to fire in return, always got through unharmed. The greater part of the Luapula above the Johnston falls is quite unnavigable for craft of any size—near Bangweulu on account of the sandbanks, and further north by reason of its shallowness and rapidity. At the narrow parts (about 250 yards) high-water mark was about 12 feet above low-water level, but where the stream widened to 600, 800, or 1200 yards, was proportionately lower. The whole country west from the Mwyangashe to about 10° 18′ S. is called Ukanda. Mr. Weatherley ascended several tributaries of the Luapula, proceeding up the Luombwa, partly on foot, to within two days of the Irumi mountains, which are, he thinks, placed too far from the Luapula in maps. The Mwyanganshe is quite unnavigable, and flows through a deserted forest country, whence the travellers were driven back by myriads of horse-flies and tsetse. Four dogs which accompanied them sickened and died a few days later. The Johnston falls, a succession of rapids and cataracts known to the natives as Mambilima, extend from 10° 46′ to 10° 33′ S. The most southern point of Mweru is placed by Mr. Weatherley in 9° 31′ 7″ S., but the Luapula entrance is some miles further north. The northern shore of the lake, from the Belgian station at the Luapula exit to Chienye, was found by rope-measurement to be 32,950 yards (almost 19 miles). With regard to his paper published in the *Journal* last year, Mr. Weatherley states that the illustrations have accidentally been mis-named. That described, *e.g.*, as "Lake Bangweolo" is really a view of the Luapula, and "Johnston falls" should be falls of the Ruirwa near Chita. He insists that Bangweulu is the only correct spelling of the name, which has nothing to do with Pa Mwelu, while the form Bangweolo is utterly unknown to the natives on the spot.

Books and Maps on South Africa.—In view of the present events in South Africa, attention may be called to some of the books and maps which may be found of use in the study of that country and its history. The choice has to be made in a wide field, but perhaps the book giving the most thoughtful and unbiassed account of South Africa as a whole, with especial regard to the inter-relations of the country and people, is Mr. Bryce's 'Impressions of South Africa,' published in 1897. Other general works which will be found useful, both from an historical and geographical point of view, are Mr. Lucas' 'Historical Geography of the British Colonies' (vol. iv.), and works of a somewhat similar scope by the Rev. W. P. Greswell. The standard authority on South African history is, of course, that of Dr. Theal, though its bulk may prove a deterrent to the general reader. Mr. Selous's well-known works give a vivid impression of life in the wilder parts of the country, while Prof. Wallace's 'Farming Industries of Cape Colony' (1896) contains some clearly written chapters on the general surface features of the country, including parts of the Transvaal, and the excellent maps by Bartholomew are a specially useful feature. A large amount of statistical and general information is to be obtained from Noble's 'Official Handbook of the Cape and South Africa,' and in the 'Guide to South Africa' by A. Samler Brown. A large number of books dealing chiefly with political questions have appeared of late years, such as Mr. W. B. Worsfold's 'South Africa,' and Captain Younghusband's 'South Africa of To-day.' Of books dealing specially with the Transvaal, 'A Naturalist in the Transvaal,' by W. L. Distant (1892), and, among various works dealing with the gold districts, those of Messrs. Hatch & Chalmers ('The Gold-mines of the Rand,' 1895) may be mentioned. For Natal we have Mr. Russell's 'Natal, the Land and its Story' (5th edit., 1897). Of general maps of South Africa, perhaps the most useful is Bartholomew's 'Tourist's Map of South Africa,' with contours of altitude shown by five shades of colour. Messrs. W. &

A. K. Johnston also issue a clear general map, while the Transvaal, with adjacent parts of the Orange Free State, etc., is shown in map No. 1159, published by the Intelligence Division, and also in a large-scale map published this year by Stanford. Natal is shown in four large sheets, drawn in the office of the Superintendent Inspector of Schools, 1893, and published in England by Stanford; but this, though the most authoritative map of the colony, is too cumbersome for general use. Revised editions of some of these maps will no doubt be soon published. Other maps to refer to are Juta's 'Enlarged Map of South Africa from the Cape to the Zambesi,' 1891, 30 miles to an inch (E. Stanford); 'Map of Bechuanaland,' from surveys made under the direction of Major-General Sir Charles Warren, G.C.M.G., R.E., 14 sheets, 2 miles to an inch, Intelligence Division, War Office, 1886; Troye's 'Map of the Transvaal,' revised edition, 1896, 6 sheets, 8 miles to an inch (E. Stanford, London); large-scale maps of certain districts of the Cape Colony, specially in the neighbourhood of Cape Town, have been issued by the Surveyor-General's Office, Cape Town. The Orange Free State Government have large-scale maps of their country, but it is impossible to obtain anything but reductions of these. Others are Stanford's new map of the Orange Free State, the southern part of the South African Republic, the northern frontier of Cape Colony, Natal, etc., 16 miles to an inch. Philips' 'Large-scale Military Map of the Seat of War, on the Natal Frontier,' 5 miles to an inch.

The Expedition to Mount Kenya.—A telegram was received from Mr. Mackinder early in October, announcing that the expedition to Mount Kenya, in which he took part, had returned successful as to its principal object. The mountain is said to have been reached by way of Meranga (? Marange, a district of Kikuyu), while the return was over the Settima range. The summit was reached at the third attempt, and proved (according to telegraphic accounts) to be over 17,000 feet in altitude, Dr. Gregory's estimate having given it a height of about 19,000 feet. Fifteen glaciers were discovered, two of them of large size.

Journey in Marocco.—We learn from the *Comptes Rendus* of the Paris Geographical Society that Dr. F. Weisgerber has lately made a journey through the interior of Marocco, during which he surveyed some new routes and visited places rarely or never visited by Europeans. During a stay at Fez he executed a detailed survey of the city, and his plan of it is reproduced in the French periodical, together with a minute description both of the city itself and of the Wed Fez, which traverses it.

The Position of Adis Ababa.—According to a note in the *Comptes Rendus* of the Paris Geographical Society (1899, p. 264), the position of the present capital of Abyssinia was fixed astronomically, during the visit of the Marchand mission, by Captain Germain and Sub-Lieut. Dyé, the observations placing the palace of Menelik in lat. 9° 4″ N., long. 38° 42′ 50″ east of Greenwich, and the church near the great market in 9° 1′ 49″ N., 38° 42′ 2″ E. The latitudes were obtained by circum-meridian altitudes of stars, culminating north and south, the longitudes by equal altitudes of the sun (for local time), and by occultations of the stars ζ Cancris and o Leonis. The results involve a considerable shifting of the position as given on the best maps. The Italian map by Captain Chaurand gives, *e.g.*, the position as in 8° 57′·5 N., 38° 56′ E., which is to be compared with the former of the above values.

The French Niger Railway.—A loan is shortly to be raised by the colony of French Guinea for the execution of the railway from Konakri to the Niger, which has been under discussion for the past few years. The original surveys were executed by Captain Salesse (*Journal*, vol. ix. p. 327), and the route will, it is said,

follow in the main the line laid down by him, though some modifications have been introduced as a result of recent surveys by M. Naudé. This scheme is, of course, quite independent of the Senegal-Niger railway.

The Development of the Cameroons.—Recent numbers of the *Deutsches Kolonialblatt* contains various items of interest respecting German activity in the Cameroons. An important step towards the extension of German influence and trade towards Lake Chad has been the expedition lately undertaken against the Sultan of Tibati, who had for some time been giving trouble to the interior stations. Captain von Kamptz, who commanded the expedition, proceeded first (February, 1899) against Tibati, the old capital of Southern Adamawa, which was reached after a difficult march by way of Yoko. The town was carried by storm in the absence of the sultan or lamido, Mohamed Amalama, who had for eleven years been investing the important town of Ngambe, chief centre of the populous district of Mandiongolo. After the fall of Tibati, where a large store of ivory fell into the hands of the victors, negotiations were opened with the Sultan of Ngaundere, who agreed to the opening of a trade route to his town by way of Yoko and Dengdeng, also placing all the Fulla states, over which he exercises an influence, under German protection. By this means the whole of South Adamawa has become subject to the Cameroons government, while the extension of German influence to Lake Chad is said to be now a matter of no difficulty. The British victories in the Sudan, which are well known in Adamawa, have contributed materially to this result. At present British products only are seen in the country, but a great impetus will no doubt now be given to German trade. On proceeding to Ngambe, Captain Kamptz found that the hostile sultan had fled, and the native chief placed himself unreservedly in the hands of the German officer. Later news states that the Sultan of Tibati has since asked for peace. The trade of the Cameroons showed a great increase during 1898, rising, as compared with 1897, from 9,712,000 to 13,898,000 marks, while the previous six years had shown a comparatively small increase. Good progress has been made with the road from Victoria to Buea, which is expected to be open for traffic throughout by January 1 next. It is proposed to extend the road northwards, in time, to Johann Albrechts-Höh, and also to construct another from Victoria to the Mungo district.

The Lower Congo.—We learn from the *Mouvement Géographique* that the railway now under construction on the north side of the lower Congo, which is intended to connect Boma with the Mayumbe district and the Shiloango river, has already reached the 25th kilometre, although the first rail was not laid before March last. The total length of the line will be about 200 kilometres (125 miles). The same journal announces that an excellent map of the whole lower Congo region, from the ocean to Stanley Pool, has been prepared by M. H. Droogmans on the large scale of 1 : 100,000. It is in fifteen sheets, but these have also been combined to form a general map on the scale of 1 : 500,000. Many modifications have been introduced as regards the hydrography, and the mapping of the whole territory north of the river has been rectified. The section including the Mayumbe district is reproduced in the *Mouvement Géographique* (No. 39), to show the line of the railway above mentioned. A new survey of the Congo estuary has been in course of execution since July last by the British Admiralty.

M. Fourneau's Expedition in French Congo.—Further details respecting this expedition (*ante*, p. 319) are given in the *Bulletin du Comité de l'Afrique Française* for August. Leaving Wesso, on the upper Sanga, on February 14, 1899, the expedition at first crossed a difficult and swampy district with few inhabitants, but abounding in elephants. The Mambili, an affluent of the Mossaka, was reached on March 4, and two days later the ground became higher, but the route

led through an uninhabited wilderness where no food could be procured. At length however, the scouts discovered a village of the Bakotas, an important tribe reaching to the right bank of the Ivindo. The districts traversed hitherto were rich in rubber vines and trees. Passing many Bakota villages, some several miles in length, the Mossaka basin was left and that of the Ivindo entered, the water-parting between the Congo and Ogowé systems being almost imperceptible Turning north in the direction of Iloku (reached by J. de Brazza), and soon after-wards resuming a more westerly course, the expedition reached the Abombe on April 2, having previously passed the head streams of the Jadie, which flows more to the north. On the 19th two columns were formed, M. Fondère descending the Ivindo to the Ogowé, while M. Fourneau maintained a westerly course. The Ivindo proved to be unnavigable in its lower course, although, according to M Fondère, it deserves to be considered as the upper course of the Ogowé, containing more water than the other branch. The two sections were united once more on the banks of the Niona, and then proceeded west through the Pahuin country as far as the Bokowe. M. Fondère then descended by river to Libreville, while M. Fourneau chose a land route, and struck the coast at the Maga creek, reaching the Gabun on June 10. M. Fourneau reports in favour of the establishment of a route for rapid transit either from the Gabun to the Sanga by the valley of the Jadie, or from the Gabun to the Mossaka by that of the Mambili.

Publications of the Congo Museum.—After the Antwerp exhibition of 1894, it was resolved that the collections from the Congo there exhibited should form the nucleus of a museum, devoted to a furtherance of the scientific knowledge of the region in all its branches. Considerable materials have already been collected, while more are likely to be added as the result of various scientific expeditions recently sent out to the territories of the state. It has therefore been resolved to add to the general utility of the work by the issue of a series of publications, bearing the title *Annales du Musée du Congo*, which may in time form a "natural, physical, and ethnographical history of the basin of the Congo." The publications will be issued in three continuous series, dealing respectively with the botany, zoology, and anthropology of the Congo, and there will be also a special series of monographs on particular subjects, such as the results of scientific expeditions, descriptions of separate regions within the Congo basin, and the like. We have already received the opening number of the three regular series, the first under the title, 'Illustrations of the Flora of the Congo,' giving plates and descriptions of plants new to science brought to light by recent investigations; while the second ('Materials for the fauna of the Congo') does the same for zoology, the first numbers being devoted to the fishes of the Congo. The first number of the anthropological series is a review, by Dr. Stainier, of the Stone age in the Congo, as elucidated by the many discoveries of stone implements which have been made within recent years, principally on the lower Congo. The publications promise to be of much interest and value, and, if continued in the style in which they have been begun, should in course of time constitute a mine of information on scientific matters connected with the Congo region. From a geographical point of view, the special series of memoirs is likely to prove of most value, for by dealing with separate regions in turn, they may in time present a complete description of the whole country. A large number of scientists have already promised their co-operation.

German Steamer for Lake Tanganyika.—News has been received in Berlin from Lieut. Schloifer, leader of the expedition entrusted with the task of placing a steamer on Lake Tanganyika, announcing the arrival of his caravan at the south end of the lake in January last. In February he proceeded to Kosanga bay, north of the Anglo-German boundary, and decided to establish there his station for the

launching of the steamer. Lieut. Schloifer reached Tanganyika by Lake Nyasa and the Stephenson road.

New Railway for Angola.—It is announced in the *Mouvement Géographique* that, by a vote of the Portuguese Cortes, the Government has been authorized to construct and work a narrow-gauge railway from Benguela to the eastern frontier of Angola. Colonization will be encouraged along the line, and ports will be constructed at Benguela and Losito bay. The necessary funds are to be provided by taxes on the export of rubber and various industries, and by the sale of lands along the railway.

AMERICA.

The Volcanoes of the Aleutian Islands.—In a recent number of the *National Geographic Magazine* (No. 8, 1899), Mr. J. Stanley-Brown points out the interest of the field for exploration which exists, on a minor scale, in the volcanoes of the Eastern Aleutian isles, especially in Mount Shishaldin (Umniak island), whose summit has never yet been reached, Prof. Pinart's claim to have ascended the mountain being based, Mr. Stanley-Brown says, on a misunderstanding of the name of the particular peak climbed. Shishaldin is a splendid snow-clad peak nearly 9000 feet high, probably one of the most gigantic cinder cones in the world. It seems to be at present in a state of gentle eruption, lava streams, columns of smoke, etc., having been reported as observed during the last year or two. On the same island is another summit, which presents the appearance of a well-formed crater, and is probably the original volcano. It apparently equals Shishaldin in magnitude. There is likewise an active volcano on Akutan, the next island to the west, rings of smoke having, in 1892, been observed by Mr. Stanley-Brown to issue from the crater. Other partially active volcanoes occur within a radius of 100 miles, and their systematic study could be accomplished in a short field season. A mail-boat now runs once a month from Sitka to Unalaska under the control of the Pacific Steam Whaling Company.

An American War-ship on the Amazon.—The United States war-ship *Wilmington* has lately made its way up the Amazon as far as Iquitos, in Peru. The *Wilmington* is a cruiser of about 1300 tons displacement, and is said to be the first war-vessel of its size which has navigated the waters of the Solimoens or upper Amazon above the mouth of the Rio Negro. Navigation here was attended with some danger owing to quantities of driftwood brought down by the rapid current, and the absence of charts showing the nature of the channel. It is proposed, after replenishing the coal-supply at Manaos, to continue the examination of the Amazon system by an ascent of the Madeira to the falls.

Journey across the Gran Chaco.—It is stated in the *Comptes Rendus* of the Paris Geographical Society (1899, p. 285), that a boat journey has lately been made by a party of Argentine settlers from the province of Jujuy to the Parana by the Bermejo and its upper branches. The start was made from Esperanza on the Sora, a left-bank tributary of the Rio Grande de Jujuy. The navigation of these streams was extremely difficult, as they were at the time in flood, and very rapid. The scenery is picturesque on the upper Bermejo, but changes abruptly as the region of the Chaco is reached. The expedition, which was due to the initiative of the brothers Leach, is said to have proved that the rivers can be made navigable for large boats.

The Guayakis of Paraguay.—Some interesting details respecting the Guayakis, a little-known and exceedingly primitive tribe which inhabits the dense forests of Eastern Paraguay, are contributed to *Globus* (vol. 76, No. 5), by Dr. R. Lehmann Nitche. The little knowledge yet possessed respecting this tribe is

derived chiefly from the observations of Count Charles de la Hitte and Dr. Ten Kate, published in the *Anales del Museo de da Plata* for 1897, but before this date some information had been supplied by Herr Schutz in an article in the *Paraguay-Rundschau* (1894). The Guayakis are extremely shy, always taking to flight on being seen, while the thickness of the forests in which they dwell, and their extraordinary physical activity, effectually prevent their being followed. Herr Schutz was only once fortunate enough to obtain sight of an individual of the tribe—dark in colour and completely naked—who glided down from a tree and vanished in the depths of the forest in an instant. He learnt, however, from an old inhabitant of Carayao, that a Guayaki man was once captured by means of the boleadoras and brought to Asuncion, but of his subsequent fate no information could be obtained. The tribe is greatly hated by the settlers on account of the depredations committed by it on the young cattle and horses, and for this reason a merciless war is waged upon them whenever possible. In 1898 a settler came upon a Guayaki woman and two children in the forest, and captured one of the latter after wounding the mother. Photographs of the child were obtained by Dr. Endlich, of Leipzig, one of which is reproduced in *Globus*. The body is well nourished and in good proportion, the head large, and the forehead well developed. A few Guayaki words were noted by Dr. Endlich, but, while confirming to some extent previous information on the subject, are not sufficient to allow definite conclusions to be based upon them. The Guayakis are of special interest as living representatives of the Stone age, making use of a stone axe for obtaining honey from trees. They live solely on this and the produce of the chase.

Further Chilean Explorations in Patagonia.—Further news regarding last season's explorations of the Patagonian Andes from the Chilean side appears in the eighth number of *Petermanns Mitteilungen* for the present year. An expedition sent by the Chilean Government to open up a road from the valley of the Cochamo by the upper course of the Manso to the Valle Nuevo returned to Puerto Montt early in May. Its leaders were Herr Oskar von Fischer, a former Danish naval officer, and a German engineer, Franz Steeger. The road had been pushed forward about 15 miles, when torrents of rain put a stop to the work. Herr von Fischer had, however, explored three passes in the direction of the Rio Manso, that most suitable for a road leading south-east from the headwaters of the Cochamo * to the middle course of the Manso. It is some hundred metres above sea-level, and has, therefore, a covering of snow in winter, but other passes lie within the region of perpetual snow. Between Lake Nahuel Huapi and the Rio Puelo two chains run north and south, both starting from the Tronador. The higher bends eastward before turning south, and is characterized by bareness and rounded forms; it forms the continental water-parting. The other runs due south, and is steeper, though lower and thickly wooded on its western edge. It divides the Cochamo and other small streams flowing west from the valley of the Manso. The Valle Nuevo, which contains the upper courses of both the Manso and the Puelo, divided only by a slight swelling of the ground, is a warm and fertile valley, much drier than the rainy regions of Llanquihue and Chilce. Indians were found in the Manso valley, having made their way thither from Nahuel Huapi across the main water-parting. Information is also given respecting the latter part of Dr. Steffen's expedition (*ante*, pp. 96, 219). From the lake named by him Lake Cochrane (Pueyrredon of Dr. Moreno), Dr. Steffen proceeded south across the basaltic region of Southern Patagonia, a circuitous route being necessary on account of the stony

* The Cochamo is a small river running from the north-east into the head of the Boca de Reloncavi, in 41° 30′ S.

and waterless tablelands, which are almost impassable for pack-animals. As far as the Santa Cruz no settlers were seen. Crossing that river below its outflow from the Lago Argentino, Dr. Steffen passed round the Sierra Baguales—then impassable on account of snow—and reached Punta Arenas by way of Puerto Consuelo on Last Hope inlet, where are thriving sheep farms in the hands of German, Scottish, Portuguese, and other settlers. Dr. Steffen was much impressed by the rapid growth of Punta Arenas.

The American Inter-Oceanic Canal.—Two entirely opposite views respecting the commercial and strategic aspects of the proposed inter-oceanic canal are taken in articles which appear in the *National Geographic Magazine* for August last. In the first, Dr. J. Nimmo, while protesting against the almost exclusive attention hitherto directed to the engineering side of the question, examines the statements generally made as to the commercial prospects of the undertaking, which he declares to be entirely without foundation. Taking Manila as typical of the ports of Eastern Asia and Australia to which vessels would sail by the proposed canal from the Atlantic states of the Union, he shows that the Suez canal route has the advantage even in point of length of voyage, and that the advantage is even greater when the differing character of the two canals is considered. As a means of communication between the Atlantic and Pacific seaboards, or between the latter and the region between the Rocky mountains and Alleghanies, he holds that the canal route—not available for sailing ships, which form one-half of the American merchant marine—will have no chance of competing with the direct railway routes, on which freights are now reduced to a minimum. The diversion of trade to rival commercial centres which would necessarily result, even were the canal a success, is not, he says, calculated to recommend the project either to the centres of commerce east of the Missouri, which would lose the direct transcontinental trade, or to the Pacific ports, which would lose that to Asia and Australia. Contrasting the American schemes with that of Suez, Dr. Nimmo maintains that, while the Suez canal connects great commercial and industrial nations, and has no competing railway, any American isthmian canal would connect two vast unproductive oceans. The more orthodox view is upheld by Prof. E. R. Johnson, in an article originally written for the *New York Independent*. This writer regards it as almost self-evident that distances will be shortened * and expenses lessened by the new route, and devotes the greater part of his article to an examination of the effects which such modifications will have on American naval power, industries, and commerce. The construction of the canal will, he holds, by adding to the effectiveness of existing ships, effect an immense saving in the naval outlay of the country, and will be of equal importance as regards its industrial development, especially by supplying a much-needed outlet to the manufactures and products of the eastern states. The two writers draw entirely opposite conclusions from the same facts. Thus, Prof. Johnson regards traffic by land handicapped by the costs of railway carriage, while he considers that the central west has benefited greatly by the water route *viâ* the great lakes and Erie canal; Dr. Nimmo, on the other hand, laying stress on the recent enormous falling off of the tonnage by the latter. Prof. Johnson allows that a new trade will have to be created to make the canal a success, but has no doubt as to the result, holding that the industrial and

---

* Whereas Dr. Nimmo based his argument, with regard to Asia and Australia, on the distances to Manila only, Prof. Johnson shows that as regards Australia, Japan, and China north of Shanghai, the proposed canal would be of decided advantage to the Eastern United States.

commercial development produced by the canal will more than make good any loss temporarily experienced by the railways.

AUSTRALASIA AND OCEANIC ISLANDS.

The Germans in the New Britain Group.—The *Deutsches Kolonialblatt* for July 1 contains the account of a visit of inspection made early in the present year by the acting governor, Herr Schnee, to the various trading stations in New Hannover, New Ireland, and adjoining islands. The natives were found in most cases well disposed to Europeans, but at constant feud among themselves, the Government being not yet in a position to put a stop to this state of things. The principal stations are on the small island of Nusa, off the north-western extremity of New Ireland, and at other points on the Nusa channel, as well as on the neighbouring coasts of New Hannover and New Ireland. Some of these, established by the New Guinea Company, are in the charge of Chinese or Malays. Cannibalism is still openly practised in these districts, and can only be checked when the authorities obtain a firmer control over the natives. A visit was paid to the Gardner islands, north of New Ireland, and here the discovery was made that both of the large islands shown on the maps are in reality cut through by narrow channels. Herr Schnee passed through such a channel, bordered with mangroves, from side to side of the northern island. During a short excursion into the interior, partly by the bed of a mountain stream, Herr Schnee was struck by resemblance to Amboina in respect of the soil and vegetation. The former was rich loam, and the growth of plants luxuriant. The tribal chiefs seem here to exercise a much greater influence than on New Britain and the parts of New Ireland that were visited. After beating about for ten days between the Gardner islands and New Ireland, unable to make any progress on account of the strong current, Herr Schnee returned by Nusa to Herbertshöhe, the seat of government on the Gazelle peninsula. He had, shortly before this voyage, undertaken a successful expedition against the Anaparpar people in the interior of the peninsula, who had lately given trouble on the coast of Weber Hafen, where, after a temporary abandonment, Europeans have again begun to form settlements.

POLAR REGIONS.

The Arctic Expeditions.—Further details respecting Peary's experiences and work during the past year are published in the St. John's *Evening Herald* of September 11 and the Brooklyn *Standard Union* of September 14. A map* is also sent us by the Peary Arctic Club at Lieut. Peary's request, which shows the exploring work accomplished in 1898–99. After parting with the *Hope* at Etah on Foulke fiord (*ante*, p. 326), the *Windward* steamed north, but, the ice being soon found unfavourable for a far advance, was placed in winter quarters abreast of Cape D'Urville at the entrance to Allman bay, Grinnell Land. Here the ship was frozen in on August 18, the whole basin and channel having been blocked all the season with heavy ice. After successful hunting operations during the autumn, Peary set out northwards along the eastern edge of the land, making caches of provisions *en route*, and by the middle of December made his way to Fort Conger, Greely's old winter quarters on Lady Franklin bay. The house was found quite undisturbed, no traveller having passed that way during the fifteen years which had elapsed since the former explorers had left it. It was during the last march that the misadventure occurred which obliged Peary and his party to spend the night in the cavity of an iceberg, and necessitated his return to the *Windward* and the amputation of seven toes. When recovered, he set

* See map, p. 592.

himself to explore Grinnell Land, which he crossed to its west coast. Good work was done in the neighbourhood of Buchanan strait and Princess Marie bay, both of which were surveyed and charted, while the supposed Hayes sound was found to have no existence. Much was accomplished in preparation for a northward advance next year, the track between Cape Sabine and Fort Conger having been so well trodden that it is likened by Peary to a post-road. In some respects the explorer has modified his plans for the future, as he intends to winter at Etah, whither he proceeded in August as soon as the *Windward* got clear of the ice. He will again take the field with the first light of the new year, whilst the *Windward*, which will be refitted and re-engined during the winter, will return north equipped for three years' further service, and will serve as a *depôt* ship at the furthest point north attainable. Captain Sverdrup's expedition in the *Fram* wintered about 50 miles south of the *Windward*, at Cocked Hat island, just within Cape Sabine, the death of the surgeon, Svensen, being the only misfortune which befell the party. Some exploration was accomplished in Ellesmere Land. On August 18 the *Fram* was off Littleton island, and the chances of reaching an advanced point on the north coast of Greenland this season seemed to be slight. The *Standard Union* contains a full account of the Peary auxiliary expedition of 1899 in the *Diana*, which made an unusually rapid passage across Melville bay owing to absence of ice. At Saunders island a note from Peary was delivered by the Eskimo, and at Foulke fiord, Henson, Peary's coloured companion, was found with a letter from Captain Bartlett of the *Windward*. Finally, after cruising north of Smith sound and reaching 79° 10′ N., the *Windward* was found anchored off Etah on August 12, and Peary encamped close by. The *Diana* arrived at Sidney, C.B., on September 12, little more than a day after the *Windward*. When still 2000 miles from home, the stock of coal had given out; but a supply was fortunately obtained from Disco island (where Sir Allen Young had coaled the *Pandora* in 1875–76), the whole crew turning to dig, aided by a party of Eskimo.

Dr. Robert Stein's Arctic Expedition.—We have already mentioned (*ante*, p. 326) that a party, headed by Dr. Robert Stein, of Washington, was taken out to Ellesmere Land in the *Diana* by the Peary Auxiliary Expedition of the past summer. Since the return of the *Diana*, Mr. Bridgman has communicated to the *Standard Union* some account of the plans and prospects of the party, which, in conformity with previous arrangements, was landed early in August at Cape Sabine, with the object of exploring Ellesmere Land. Dr. Stein, who is accompanied by Leopold Kann and Samuel Warmbath, purposed to winter in that neighbourhood, hoping to have an opportunity of returning by one of Peary's steamers next year. According to present arrangements, however, the *Windward* will proceed north next summer, and not return till Peary's work is finished; so that, as Mr. Bridgman remarks, it will be incumbent on Dr. Stein's friends to make some arrangements, either to bring him home or possibly to send by the *Windward* stores to enable him to spend another winter in the arctic. The fact that the *Fram* wintered last year in the neighbourhood of Ellesmere Land makes it doubtful whether much new work will be left for Dr. Stein and his companions to accomplish, and they seem, besides, to be badly equipped for journeys of any extent.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Tidal Observations round the Coast of England and Wales.—In 1896 the Ordnance Survey conducted a series of tidal observations round the coast of England and Wales for the purposes of the survey itself, and with a view to ascertain whether the observations undertaken in 1859 still remained approximately correct. A circular on the subject by Colonel Sir J. Farquharson, the late Director-

General of the Ordnance Survey, has recently appeared as an Addendum to the 'Abstract of the Ordnance Survey Spirit Levelling of England and Wales,' issued in 1861. Taking the result as a whole, there is only a difference of $1\frac{3}{4}$ inch between the results of 1859 and 1896, which indicates that there has been practically no change in the mean level of the sea round England and Wales during the last forty years. The following tables give the results of observations taken in 1859 and 1896.

LEVELS OF THE SEA ABOVE THE ORDNANCE DATUM

1859.

Appledore	+0·690
*Battersea	+2·500
Berwick-on-Tweed	+0·389
Birkenhead	+1·113
Cardigan	+0·779
*Deptford	+2·020
Dover	+0·417
Falmouth	−0·001
Fleetwood (mean)	+1·888
Great Grimsby	+1·814
Harwich	+1·883
Holyhead	+0·462
Hull	+0·688
Liverpool	−0·068
*London Bridge	+2·440
Lowestoft	+1·382
Lyme Cobb	+1·490
North Shields	+0·990
Pembroke	+0·554
Penzance	+0·004
Plymouth	−0·359
Portsmouth	+0·302
Ramsgate	+0·974
Scarborough	+0·334
Sheerness	+1·448
Shoreham	+0·189
Silloth	−0·633
Southampton	+0·791
Sunderland	+0·714
Torquay	+0·433
Western super-Mare	+0·121
Weymouth	+0·561

Mean sea-level at twenty-nine stations above the ordnance datum at Liverpool, +0·650 foot

* Omitted for calculating the mean.

1896

Berwick-on-Tweed	+0·457
Brighton	+0·711
Cardigan	+1·391
Cardiff	+0·994
Dover	+0·532
Falmouth	+0·017
Fleetwood	+0·738
Harwich	+1·657
Holyhead	−0·242
Hull	+1·044
Liverpool	−0·057
Lowestoft	+1·567
Milford	−0·653
New Brighton	−0·315
Penzance	+0·662
Portland	+0·213
*Rotherhithe	+2·167
Sheerness	+1·551
Silloth	+0·358
Tynemouth	−0·213
Torquay	+0·377
West Hartlepool	−0·020
Weston-super-Mare	+0·611

Mean sea-level at twenty-two stations above the ordnance datum at Liverpool, +0·517 foot

* Omitted for calculating the mean.

OBITUARY.

Chief Justice Charles P. Daly, LL.D.

OUR honorary corresponding member, Judge Daly, died at his country seat, near Sag Harbour, New York, on September 19, at the age of eighty-four years. His strength had perceptibly failed since his return from Europe in 1895, but his mind retained its serenity and vigour to the end.

He was born October 31, 1815, in the city of New York. His father, a master carpenter, died while the boy was still at school, and thus thrown upon his own resources, Charles obtained employment as a merchant's clerk at Savannah, Georgia, and not long after shipped as a sailor. After three years at sea he settled

in New York, learned a trade, and spent his evenings in study. At the close of his apprenticeship, he entered the law office of Mr. William Soule, where in less than four years he acquired such proficiency that Chief Justice Nelson, in 1839, relaxed in his favour the rule requiring seven years' study, and admitted him to practice.

In 1843 he was elected to the Legislature, and in the following year was appointed, on the recommendation of ex-Governor Marcy, Judge of the Court of Common Pleas. He took his seat May 4, 1844, and served continuously for nearly forty-two years, being retired December 31, 1885, by the limitation of age. He became Chief Justice in 1871. His judicial integrity and ability made an abiding impression upon the community, and his seat was never imperilled at any election, while in one particularly bitter contest he was the candidate of both parties and received every vote cast.

The degree of LL.D. was conferred upon Judge Daly in 1860 by Columbia College, in recognition of his eminence as a jurist and his wide and varied literary culture. His studies in history had stimulated his early interest in geography, and he became a Fellow of the American Geographical Society not long after its foundation. He was elected President in 1864, and re-elected every year for thirty-five years. His annual addresses often dealt with particular subjects, mostly with a bearing on the historical side of geography. Thus in 1879 he gave a useful sketch of the early history of cartography, while in 1893 he discussed the subject of the genuineness of the portrait of Columbus which has come down to us. His devotion to the aims of the Society was unwearied, and he was foremost in every effort to promote the study of geography in America. He gave special attention to the growth and development of the Society's library, to which he contributed generously from his own collection.

Judge Daly had travelled extensively in Europe. He represented his Society at the Venice meeting of the International Geographical Congress in 1881, and again at the London meeting of 1895, being chosen on the latter occasion to reply on behalf of the foreign members to the addresses of welcome delivered at the opening meeting. He was an honorary member of the Geographical Societies of Berlin and St. Petersburg, as well as of our own.

A man of singularly sweet nature, dignified and modest, he possessed an irresistible charm of manner. His long married life, though unblessed by children, was a period of unbroken happiness. Mrs. Daly died in 1894.

William Simpson.

The veteran war artist of the *Illustrated London News*, Mr. William Simpson, who died in August last at his residence at Willesden, had been a Fellow of our Society since 1863. Mr. Simpson's professional employments had given him a wide acquaintance with foreign countries, and had taken him to some out-of-the-way places, so that his experiences were of the most varied character. More than twenty years ago he read a paper before our Society on the Modoc regions of California (printed in vol. xix. of the old series of *Proceedings*), and a few years later he gave the British Association the benefit of his experiences in Afghanistan, whither he had proceeded with the Peshawur Field force, under Sir Samuel Browne. During the stay of the troops at Jalalabad, he made interesting archæological explorations in the neighbourhood, which threw some light on the Buddhist period in that valley. Mr. Simpson was born at Glasgow in 1823, and educated at that city and at Perth. He had at first given his attention to architecture, but soon took up art as a profession. He went through the Crimean war, the Abyssinian

campaign, and the Franco-German war, as well as the Afghan war of 1878–79. During his first visit to India he spent some time in the investigation of Buddhist topes, while some years later he visited the Troad to illustrate the scene of Dr. Schliemann's explorations. Russia and China also fell within the scope of his extensive travels.

Dr. Oskar Baumann.

Dr. Oskar Baumann, one of the best known of the modern generation of African explorers, has lately died at Vienna at the early age of thirty-five years. Dr. Baumann's African work began when he was only twenty-one, his attention being first directed to the west coast, whither he accompanied Dr. Lenz on his Congo expedition of 1885. Dr. Baumann's survey of the lower and middle course of the river on this occasion supplied valuable additions to African cartography. In 1888 he turned his steps to German East Africa, with which the rest of his work as an explorer was concerned. After minor expeditions in Usambara and other regions near the coast, he set out in 1898 on the important journey to the Nile sources, which will be remembered as his principal achievement. The route was so planned as to traverse a large extent of new ground, and the additions to our knowledge, both of the region of steppes and inland drainage between the Kilimanjaro and the Victoria Nyanza, and of the south-western watershed of the Nile, were of much value. Dr. Baumann's work was marked by great thoroughness, and the work in which this journey was described still ranks as one of the best authorities on the geography and ethnology of East Africa. He afterwards did good work by executing a survey of Zanzibar island and its neighbours on the East African coast. He was for a time Austrian consul at Zanzibar, where he contracted the malady to which he has now succumbed.

CORRESPONDENCE.

"Was Australia Discovered in the Sixteenth Century?"

Haigh Hall, Wigan, October 10, 1899.

MAY I be allowed to point out an inaccuracy in the footnote on p. 421 to Mr. Edward Heawood's paper, "Was Australia discovered in the Sixteenth Century?" In referring to the early French maps, he states that "Three of these maps, now in the British Museum, were last year published in facsimile by the late Mr. C. H. Coote, with explanatory letterpress." This is a most misleading statement, and in the future may give rise to vain inquiries. The Harleian (circa 1536) map, and the Desceliers map, dated 1550, are in the British Museum; but the Desceliers map of 1546 is in the library of the Earl of Crawford at Haigh Hall. I may further add that the facsimiles were privately printed by the Earl of Crawford, and were not published by Mr. Coote, although he wrote an introduction which was issued at the same time. I cannot understand the suppression of Pierre Desceliers' name in Mr. Heawood's article. One would naturally conclude that all three maps are anonymous, whereas the second and third are signed and dated.

J. P. EDMOND.

[I much regret the inaccuracy to which Mr. Edmond calls attention, and can only plead in excuse that the note in question was added from memory when at a distance from all means of verification, in expectation of an opportunity—which did not occur—for further revision. The omission—entirely unintentional—of Desceliers' name arose probably in part from the wish to reduce to a minimum the

recapitulation of well-known facts, and in part because attention was directed rather to the unknown prototype on which all the maps, as regards this part of the world, appear to be based, than to the existing maps themselves. I find on referring to the rough copy of the article that the name originally appeared, but was eliminated through subsequent compression.*—E. HEAWOOD.]

Andrée's Route.

It cannot fail to be of interest, and it may be of use to those who contemplate a search expedition for Herr Andrée, to be in possession of the following record of winds in his neighbourhood for a few days after his ascent. I sent it to the *Times*, and it appeared in the issue of that paper of October 10.

"The discovery of a buoy, unquestionably belonging to Andrée's balloon, has again revived speculation as to the course followed by the Eagle after the ascent from Spitsbergen; and it has occurred to me that a few notes of the wind and weather experienced within about 300 miles of the balloon for certainly three days after it started should be of value in assisting opinion.

"Now, when Andrée started on July 11, 1897, the *Windward* (the ship purchased by Mr. Harmsworth for his expedition and afterwards given by him to Lieut. Peary for further arctic work) was about this distance from him, dodging about in the close-packed ice south of Franz Josef Land. When Andrée ascended the wind with him was S.S.W., driving him in a N.N.E. direction. At that moment a light south-east wind was still with the *Windward;* but on the following day, about twenty-four hours later, the south-west wind reached her. July 13 was ushered in with snow, and a heavy swell came up from the south-west, resulting from the wind which had blown from that direction the day before. On July 13 Andrée despatched the only message we have received from him, in which he said he was in 82° 2′ N. lat. and 15° 5′ E. long., and was going east 10° south; or, in other words, was being driven by a wind north of west. Almost exactly twenty-four hours later—as before—the wind reached the *Windward*, on July 14, and lasted for about twelve hours. The weather had varied from cloudy to clear, but this wind brought dense fog. On July 15, at 8 a.m., when Andrée might have been somewhere north-east of the *Windward*—perhaps not more than 200 miles distant—the wind again shifted, this time to the south, and from that quarter it blew with steadily increasing force throughout the day (with considerable rain), veering in the night to south-west.

"If I may offer an opinion, I would say that if the weather which his neighbour the *Windward* had be any criterion, the fresh and strong southerly breezes of July 15 would have carried Andrée far to the north."

It is open to us, from the foregoing facts, to believe that Herr Andrée turned north in his balloon, on July 15, when somewhere north-west of the north point of Nova Zembla—probably about 60° E. long. and 80° N. lat. The appearance of the buoy on the north coast of King Charles Land would not be inconsistent with this assumption.

ARTHUR MONTEFIORE BRICE.

1D, Hyde Park Mansions, W.

* A printer's error which occurs on p. 425 may be noted here. Since the type was first set up two of the letters of the word "Aljofar" (four lines from bottom) have become transposed.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them a employed to indicate the source of articles from other publications. Geographic names are in each case written in full :—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books i the list below is denoted by the length and breadth of the cover in inches to the neares half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Austria-Hungary. *Jahrb. Ungar. Karpathen-V.* **26** (1899): 56–90. **Loysch**

Die Orometrie der Hohen Tátra. Von Edmund Loysch.

Austria—Meteorology. ——

Jahrbücher der k. k. Central-Anstalt für Meteorologie und Erdmagnetismus. Jahrgang 1895, 1896, und 1898. I. Thiel. Wien, 1898–99. Size 12 × 9½, pp. (1895) xxiv. and 192; (1896) xxvi. and 148; (1898, I. Th.) 134, 38, and 16.

Austria—Moravia. *M.G. Ges. Wien* **42** (1899): 193-209. **Trampler**

Das Holsteiner Thal; eine Karststudie aus Mähren. Von R. Trampler. *With Plans.*

Belgium. *Rev. Française* **24** (1899): 517–522. **Barré**

La Belgique maritime. Par M. Paul Barré. *With Maps and Plan.*

On the seaports of Belgium, and the proposals for improving them.

Denmark—Bornholm. *Globus* **76** (1899): 85-91; 117-127. **Buschan**

Bornholm. Von Dr. G. Buschan. *With Map and Illustrations.*

Denmark—Copenhagen. *B.S.G. Com. Bordeaux* **22** (1899): 339–367. **Ferrière.**

Le port franc de Copenhague. Par M. André Ferrière.

Europe—Anthropology. **Ripley.**

A Selected Bibliography of the Anthropology and Ethnology of Europe. By William Z. Ripley, PH.D., Boston. Published by the Trustees of the Public Library, 1899. Size 9 × 6, pp. x. and 160. *Presented by the Compiler.*

This list contains nearly two thousand titles of works referred to by Prof. Ripley in compiling his "Races of Europe." They are arranged alphabetically under authors' names, with an index arranged alphabetically under subjects, the subjects including countries and provinces.

Europe—Fauna. **Scharff.**

The History of the European Fauna. By R. F. Scharff, B.SC. London: W. Scott, Limited, 1899. Size 7½ × 5, pp. viii. and 364. *Maps and Illustrations. Price* 6s. *Presented by the Publishers.*

A special note on this important book will be given in the *Journal.*

France. *B.S.G. Rochefort* **20** (1898): 3, 81, 161, 225; **21** (1899): 3. **Vincent.**

Une paroisse, autrefois, en Angoumois (Marillac-le-Franc). Par Ernest Vincent.

France—Chamonix. **Whymper.**
Chamonix and the range of Mont Blanc. A Guide by Edward Whymper. Fourth edition. London: John Murray, 1899. Size $7\frac{1}{2} \times 5$, pp. xiv. and 206. *Maps and Illustrations. Price 3s. Presented by the Author.*

France—Corsica. *Globus* 76 (1899): 1-3; 27-31. **Ratzel.**
Korsische Städte. Von Friedrich Ratzel.

Germany—Halle. *M.V. Erdk. Halle* (1899): 108-110. **Lorenz.**
Beschreibung der Stadt Halle im 16 Jahrhundert. Aus einer Handschrift G. v. Alvenslebens mitgeteilt von G. Lorenz.

Germany—Prussia. *M.V. Erdk. Halle* (1899): 59-64. **Halbfass.**
Der Arendsee in der Altmark (Nachträge). Von Dr. W. Halbfass.

Germany—Prussia. *M.V. Erdk. Halle* (1899): 1-55. **Mertens.**
Der Hopfenbau in der Altmark. Von Dr. A. Mertens. *With Map.*

On the distribution of hop-growing in the Altmark.

Germany—Prussia. *Globus* 76 (1899): 181-192. **Tetzner.**
Die Philipponen in Ostpreussen. Von Dr. F. Tetzner. *With Map and Illustrations.*

The Philipponen were a Russian sect who emigrated to East Prussia in 1700.

Germany—Prussia. *M.V. Erdk. Halle* (1899): 89-96. **Weyhe.**
Wüstungen im und am Kliekener Luch. Von Prof. E. Weyhe. *With Map.*

Russia—Odessa. **Mackie.**
Trade of Odessa for the year 1898. Foreign Office, Annual No. 2255, 1899. Size $10 \times 6\frac{1}{2}$, pp. 38. *Price* $2\frac{1}{2}$*d.*

Russia—Poland. **Murray.**
Trade and Agriculture of Poland and Lithuania for the year 1898. Foreign Office, Annual No. 2226, 1899. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 54. *Map. Price* $4\frac{1}{2}$*d.*

Russia—Taganrog. **Hunt.**
Trade of Taganrog and District for the year 1898. Foreign Office, Annual No. 2265, 1899. Size $9\frac{1}{2} \times 6$, pp. 34. *Price* $2\frac{1}{2}$.

Russia—Urals. **Högbom.**
Om de vid syenitbergarter bundna jernmalmerna i östra Ural. Af A. G. Högbom. —Meddelanden från Upsala Universitets Mineralogisk-Geologiska Institution. 23. Stockholm, 1898. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. 115-134. *Illustrations.*

Scandinavia. *G. Tidskrift* 15 (1899): 40-52. **Geer.**
Gerard de Geer: Om Skandinaviens geografiska utveckling efter istiden. Referat af cand. mag. N. Hartz.

A summary of Prof. Gerard de Geer's work on the geographical evolution of Scandinavia since the glacial period, published in Stockholm in 1896.

Spain. **Harrison.**
Trade of Spain for the year 1898. Foreign Office, Annual No. 2245, 1899. Size $10 \times 6\frac{1}{2}$, pp. 54. *Price 3d.*

Spain—Bilbao. **Smith.**
Trade of Bilbao and District for the Year 1898. Foreign Office, Annual No. 2240, 1899. Size 10×6, pp. 40. *Price* $2\frac{1}{2}$*d.*

Spain—Cadiz. **Vecqueray.**
Trade of Consular District of Cadiz for the year 1898. Foreign Office, Annual No. 2223, 1899. Size $9\frac{1}{2} \times 6$, pp. 30. *Price 2d.*

This report describes the progressive decline of the port of Cadiz, and refers to the efforts being made to restore prosperity by running the "Sud express," which now stops at Madrid on to Cadiz, and so making it a port for passengers joining the Mediterranean steamers.

Sweden—Geology. **Högbom.**
Om urkalkstenarnas topografi och den glaciala erosionen. Af A. G. Högbom.— Meddelanden från Upsala Universitets Mineralogisk-Geologiska Institution. 24. Stockholm, 1899. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. 189-206.

Sweden—Gravity. *Bihang K. Svensk. Vet.-A. Handlingar* **24** (1899): 1–36. **Rosén.**
Bestimmung der Intensität der Schwerkraft auf den Stationen Haparanda, Hernösand, Upsala, Stockholm und Lund. Von P. G. Rosén.

Sweden—Meteorology. ———
Observations Météorologiques Suédoises publiées par l'Académie Royale des Sciences de Suède, exécutées et rédigées sous la direction de l'Institut Central de Météorologie, vol. 35, 2-ième série; vol. 21. 1893. Stockholm, 1898. Size 12½ × 10, pp. viii. and 156.

Switzerland. *Geolog. Mag.* **6** (1899): 259–270. **Jennings.**
On the Courses of the Landwasser and the Landquart. By A. Vaughan Jennings. *With Maps.*

Discusses Prof. Heim's theory as to the changes which have taken place in the mountain streams of Graubunden, in which he sees evidence of river-capture. Mr. Jennings, after studying the locality, brings forward another theory to account for the present condition of the Davos valley.

Switzerland—Folklore. **Zahler.**
Die Krankheit im Volksglauben des Simmenthals. Ein Beitrag zur Ethnographie des Berner Oberlandes. Von Dr. Hans Zahler.—Arbeiten aus dem Geographischen Institut der Universität Bern. Heft iv. (Separat-Abdruck aus dem XVI. Jahresbericht der Geographischen Gesellschaft von Bern.) Bern, 1898. Size 9 × 6¼, pp. 140. *Presented by the Author.*

On the popular superstitious beliefs as to illness in the Simmenthal.

Switzerland—Geology. **Früh.**
Vierteljahrsb. Naturforsch. Ges. Zürich **44** (1899): 157–191.
Der postglaciale Löss im St. Galler Rheinthal mit Berücksichtigung der Lössfrage im allgemeinen. Von J. Früh.

A contribution to the study of the origin of loess.

Turkey—Albania. *Scottish G. Mag.* **15** (1899): 337–350. **Callan.**
Albania and the Albanians in 1898. By the Rev. Hugh Callan, M.A. *With Illustrations.*

United Kingdom. *Yorkshire Ramblers' Club J.* **1** (1899): 54–64. **Cuttriss.**
The Caves and Pot-Holes of Yorkshire. By S. W. Cuttriss.

United Kingdom. *Yorkshire Ramblers' Club J.* **1** (1899): 49–53. **Robinson.**
The West Wall of Deep Ghyll. By J. W. Robinson.

United Kingdom—England. ———
Tidal Observations and Ordnance Survey Levelling. Addendum to the "Abstract of the Ordnance Survey Spirit Levelling of England and Wales." Issued in 1861. Size 12½ × 10, pp. 4.

Results of redetermining mean sea-level at a number of stations on the coast of England and Wales, in order to place on record the difference between assumed mean tide-level at Liverpool—the datum for all the Ordnance Survey levelling—and the actual mean sea-level at different points, see *Journal*, p. 572.

United Kingdom—England. **Baxendell.**
Borough of Southport. Meteorological Department. The Fernley Observatory, Southport. Report and Results of Observations for the year 1898. By Joseph Baxendell. Southport, 1899. Size 10 × 7½, pp. 28. *Diagram.*

United Kingdom—England. **Cornish.**
On the Grading of the Chesil Beach Shingle. By Vaughan Cornish, M.Sc., etc. [From *Proceedings* Dorset Natural History and Antiquarian Field Club, vol. xix., 1898, pp. 113–121.] Dorchester, 1898. Size 8½ × 6. *Illustrations. Presented by the Author.*

United Kingdom—England. *T. Edinburgh Geolog. S.* **7** (1899): 469–476. **Greenly.**
The Hereford Earthquake of December 17, 1896, considered in relation to Geological Structure in the Bangor-Anglesey Region. By Edward Greenly. *With Map.*

United Kingdom—England. **Nares.**
Report on the Present State of the Navigation of the River Mersey (1898), to the Right Honourable the Commissioners for the Conservancy of the River Mersey. By Vice-Admiral Sir G. S. Nares, K.C.B., F.R.S. London: Printed by Phipps & Connor, 1899. Size 10 × 6½, pp. 20. *Presented by the Mersey Conservancy.*

United Kingdom—Meteorology. *J. School G.* **3** (1899): 223-227. **Herbertson.**
Pressure, Winds, and Rainfall over the British Islands. By A. J. Herbertson.

United Kingdom—Scotland. *T. Edinburgh Geolog. S.* **7** (1899): 416-419. **Wallace.**
Geological Notes on Strathdearn and the Aviemore Railway. By Thomas D. Wallace.

Observations on the new line which cuts off a wide curve on the Highland railway between Aviemore and Inverness.

ASIA.

Asia Minor. *B.S.R. Belge G.* **23** (1899): 205-231. **Oehlmann.**
L'Asie Mineure au point de vue de l'emigration allemande. Par le Dr. E. Oehlmann.

China. *C. Rd. S.G. Paris* (1899): 271-281. **Fauvel.**
Les diamants Chinois. Par M. A. A. Fauvel.

China. *M.G. Ges. Wien* **42** (1899): 210-234. **Fischer.**
Meine Erlebnisse an der Ostküste Chinas. Von E. S. Fischer.

China. *J. Manchester G.S.* **14** (1898): 361-364. **Little.**
China. By Mrs. A. Little.

China—Che-Kiang. **Carli.**
Il Ce-Kiang, studio geografico-economico del Dott. Mario Carli. Roma, 1899. Size 9½ × 6½, pp. xx. and 278. *Map. Presented by the Author.*

China—Historical. *B.S.G. Lisboa* **16** (1897): 649-661. **Montalto de Jesus.**
Centenary of India. Early Portuguese intercourse with China. By C. A. Montalto de Jesus.

China—Tientsin. *B.S.R. Belge G.* **23** (1899): 232-268. **Bure.**
Tientsin. Par Pierre Bure.

India. *Contemporary Rev.* **76** (1899): 153-173. **Fairbairn.**
Race and Religion in India. By A. M. Fairbairn, D.D.

India—Darjiling. *Globus* **76** (1899): 192-195. ———
Ein Besuch in Dardschiling. *With Illustrations.*

India—Historical. **Foster.**
The Embassy of Sir Thomas Roe to the Court of the Great Mogul, 1615-1619, as narrated in his Journal and Correspondence. Edited from Contemporary Records by William Foster, B.A. 2 vols. London: Printed for the Hakluyt Society, 1899. Size 9 × 6, pp. xii., lxviii., and 586. *Portrait, Maps, and Illustrations. Presented by the Hakluyt Society.*

This edition of Sir Thomas Roe's embassy is largely printed for the first time from Roe's original manuscript, supplemented, where it is incomplete, from Purchas, and accompanied by numerous letters and notes throwing light from contemporary sources on some of the references.

India—Karakoram Mountains. *Scottish G. Mag.* **15** (1899): 523-526. **Workman.**
Ascent of the Biafo Glacier and Hispar Pass: Two Pioneer Ascents in the Karakoram. By Fanny Bullock Workman.

India—Kashmir. *Mem. Geolog. Surv. India* **28** (1898): 1-27. **Diener.**
Notes on the Geological Structure of the Chitichun Region. By Dr. Carl Diener.

India—Madras—Anthropology. **Thurston.**
Madras Government Museum. Bulletin, vol. ii. No. 3. Anthropology. Kādirs of the Ānaimalais; Malaiālis of the Shevaroys; Syllabus of Demonstrations on Anthropology; The Dravidian Head; The Dravidian Problem. By Edgar Thurston. Madras, 1899. Size 8½ × 5½, pp. 131-197. *Illustrations.*

India—North-West Frontier. *Mem. Geolog. Surv. India* **28** (1898): 96-117. **Hayden.**
On the Geology of Tirah and the Bazar Valley. By H. H. Hayden, B.A., B.E. *With Plate and Sections.*

India—Vizagapatam. ———
Report of the Condition and Progress of the G. V. Juggarow Observatory, Vizagapatam. Including the Results of Observations for the year 1897. Calcutta, 1899. Size 9 × 6½, pp. 60. *Plate and Diagram.*

Indo-China—Laos. *B.S.G. Com. Paris* 20 (1898): 609–625. **Lefèv**
Le Haut Laos, sa situation économique. Par M. le Dr. Lefèvre. *With Map.*

Japan. *National G. Mag.* 10 (1899): 329–337. **Aust**
The Commercial Development of Japan. By O. P. Austin.

Japan. *J.G. Tokyo G.S.* 11 (1899): 413–422, 475–504. **Ogaw**
Geologic Structure of the Japanese Islands. By Takudzi Ogawa. [In Japanese.]

Japan. *J.G. Tokyo G.S.* 11 (1899): 194–203. **Suzu**
The Otsuji Coal-fields in Onga, Chikuzen. By Toshi Suzuki. [In Japanese.]

Japan. **Gowla**
The Dolmens of Japan and their Builders. By W. Gowland. Reprinted from the *Transactions and Proceedings of the Japan Society*, vol. iv. part iii. London: Printed by W. Clowes & Sons, 1899. Size 11 × 8, pp. 56. *Illustrations. Presented by the Author.*

The author has studied 406 dolmens or ancient stone-built sepulchral chambers Japan, and made drawings or measurements of 140. On these the present paper founded.

Japan. **Ja**
Foreign Trade of Japan for the year 1898. Foreign Office, Annual No. 2277, 1899. Size 9½ × 6, pp. 32. *Price 2d.*

Japan—Coal. *J.G., Tokyo G.S.* 11 (1899): 114–125. **Suzu**
The Otsuji Coal-fields in Onga, Chikuzen. By Toshi Suzuki. [In Japanese.]

Japan—Formosa. *J.G., Tokyo G.S.* 11 (1899): 33–44. **Inouy**
Present and Future of the Industries of Formosa. By Jintarō Inouye. [In Japanese.]

Japan—Formosa. *J.G., Tokyo G.S.* 11 (1899): 126–136. **Ish**
A Geological Exploration of Formosa. By Yamajiro Ishii. [In Japanese.]

Japan—Formosa. *J.G., Tokyo G.S.* 11 (1899): 16–32. **Ish**
A Geological Exploration of Formosa. By Yamajiro Ishii. [In Japanese.]

Japan—Yokohama. **Forst**
Trade of Yokohama and District for the year 1898. Foreign Office, Annual No. 2290, 1899. Size 10 × 6½, pp. 24. *Price 1½d.*

Korea. **Jorda**
Trade of Corea for the year 1898. Foreign Office, Annual No. 2304, 1899. Size 9½ × 6, pp. 24. *Price 1½d.*

Malay Archipelago. *J. College Sci. Imp. University Tokyo* 11 (1899): 83–120. **Kot**
On the Geologic Structure of the Malayan Archipelago. By B. Kotô, PH.D. *With Map.*

Malay Archipelago—Celebes. **Kruij**
Tijds. Indische Taal-, Land- en Volkenk. 41 (1899): 80–92.
De adoptie in verband met het matriarchaat bij de Toradja's van Midden-Celebes. Door Alb. C. Kruijt.

On the customs of the people of Central Celebes.

Malay Archipelago—Java. **Chapell**
Tijds. Indische Taal-, Land- en Volkenk. 41 (1899): 32–54.
Nota betreffende het Jengger-gebied. Door H. M. la Chapelle.

Malay Archipelago—Java. **Kohlbrugg**
Tijds. Indische Taal-, Land- en Volkenk. 41 (1899): 70–79.
De Linggatempel en andere oudheden op het Yanggebergte. Door Dr. J. H. F. Kohlbrugge. *With Plan and Plates.*

Malay Archipelago—Java. **McLachla**
Trade of Java for the year 1898. Foreign Office, Annual No. 2253, 1899. Size 9½ × 6½, pp. 22. *Price 1½d.*

Malay Peninsula. *J.R. Colonial I.* 30 (1899): 549–581. **Cliffor**
Life in the Malay Peninsula; 'As it was and is.' By Hugh Clifford.

Malay States. **Swettenham.**
Report by the Resident-General of the Federated Malay States to His Honour the Acting High Commissioner (Sir Alexander Swettenham, K.C.M.G.). Kuala Lumpur, 1899. Size 13½ × 8½, pp. 8.

Persia. *J.R. United Service I.* **43** (1899): 737-751. **Temple.**
The Strategic Relation of Persia to British Interests. Lecture by the Rt. Hon. Sir Richard Temple, Bart., G.C.S.I., etc.

Discusses the relations of Persia to Russia and the United Kingdom.

Persia—Azerbaijan. **Wood.**
Trade of Azerbaijan for the year 1898-99. Foreign Office, Annual No. 2291, 1899. Size 10 × 6½, pp. 14. *Price* 1*d.*

Persia—Ispahan. **Preece.**
Trade of Ispahan and District for the years 1897-98 and 1898-99. Foreign Office, Annual No. 2260, 1899. Size 10 × 6½, pp. 22. *Price* 1½*d.*

The report bears witness to the disorganized state of Persia, and the difficulties which are experienced by foreign merchants.

Philippine Islands. *Quarterly Rev.* **190** (1899): 198-220. ——
The Philippines and their Future.

Philippine Islands. *National G. Mag.* **10** (1899): 271-272. ——
Meteorology in the Philippines.

The official meteorological observer at Hongkong complained to the American authorities of the Philippines because the Jesuit observatory at Manila telegraphed warnings of typhoons to Hongkong. This, it appears, was held to be contrary to international courtesy, which forbids a scientific institution to predict storms in any country except that in which it is situated; and the Jesuits were accordingly forbidden to announce the routes of approaching typhoons in Hongkong and Singapore.

Philippine Islands. *Rev. Française* **24** (1899): 344-352. **Lasalle.**
Philippines: L'insurrection de 1896-1897. Par C. de Lasalle. *With Map.*

Philippine Islands. *P.R. Artillery I.* **26** (1899): 309-320. **Simonds.**
Manila under the Americans. By Captain C. B. Simonds, R.A. *With Map.*

Philippine Islands. **Sonnenburg.**
M. Deutsch. Ges. Natur- u. Völkerk. Ostasiens **7** (1899): 285-292.
Stimmungsbilder aus Manila. Von Major Falkner von Sonnenburg.

A graphic description of the capture of Manila, told by a German military officer.

Russia—Caspian Sea. *Globus* **76** (1899): 13-17. **Seidlitz.**
Der Karabugas-Meerbusen des Kaspischen Meeres. nach den Ergebnissen der vom Ministerium der Landwirtschaft ausgesandten Expeditionen. Von N. v. Seidlitz. *With Map.*

Russia—Central Asia. *Petermanns M.* **45** (1899): 125-126. **Friederichsen.**
Meteorologische Beobachtungen in Luktschun, Zentralasien. Von Dr. M. Friederichsen.

Russia—Central Asia. *Imp. and Asiatic Quarterly Rev.* **7** (1899): 114-125. **Parker.**
Khokand and China. By E. H. Parker.

Russia—Siberia. ——
Travaux de la Sous-Section Troitzkossawsk-Kiakhta Section du pays d'Amour de la société Imperiale Russe de Géographie. Tome i. livraisons 1 and 2. 1898. [In Russian.] Moscow, 1899. Size 10 × 7, pp. (liv. 1) 82; (liv. 2) 78. *Plates.*

Russia—Siberia. *J.R. United Service I.* **43** (1899): 543-549. **Havelock.**
The Trans-Baikal. Translated from the 'Voïénnyi Sbórnik.' By H. Havelock.

On the means of communication and climate of the Trans-Baikal territory.

Russia—Siberia. *Ymer* **19** (1899): 147-157. **Nilsson.**
Om de växtgeografiska och botaniska arbetena under Andrée-efterforskningsexpeditionen till Sibirien 1898. Af N. Herm. Nilsson. *With Illustrations.*

On the botanical observations made during the Andrée search expedition in Siberia.

Russia—Siberia. *Ymer* 19 (1899): 117–146. **Stadling.**
Efterforskningarna efter Andrée-expeditionen i Sibirien. Af J. Stadling. *With Map and Illustrations.*

On the journey through Northern Siberia from the Yenesei to the Lena delta in search of news of Andrée's expedition.

Russia—Transcaspian. *Scottish G. Mag.* 15 (1899): 356–361. ——
The Transcaspian Desert.

Russian Central Asia. *Deutsche G. Blätter* 22 (1899): 124–133. **Rickmers.**
Die Barren der Danduschka. Von Willy Rickmer Rickmers. *With Illustrations.*

Description of some peculiarities in the physical geography of the mountains and valleys in Bokhara.

Siam. *Imp. and Asiatic Quarterly Rev.* 7 (1899): 76–91. **Barrett.**
Siam and its neighbours. By the Hon. John Barrett.

Turkey—Palestine. *Palestine Exploration Fund, Q. Statement* (1899): 188–199. **Bliss.**
First Report of the Excavations at Tell-es-Sâfi. By F. J. Bliss, PH.D. *With Plan and Illustration.*

Turkey—Palestine. *Palestine Exploration Fund, Q. Statement* (1899): 170–187. **Bliss.**
Third Report on the Excavations at Tell Zakarîya. By F. J. Bliss, PH.D. *With Plan and Sections.*

Turkey—Syria. **Drummond-Hay.**
Trade of Beirut and the Coast of Syria for the year 1898. Foreign Office, Annual No. 2286, 1899. Size 10 × 6½, pp. 20. *Price* 1½*d.*

Discusses the cause of the steady decline of the trade of the port of Beirut and of the railway from Beirut to Damascus. The construction of the railway from Haifa to Damascus is proceeding.

Turkey—Syria. **Richards.**
Trade of Damascus for the year 1898. Foreign Office, Annual No. 2306, 1899. Size 10 × 6, pp. 16. *Price* 1*d.*

Gives some particulars as to the Damascus-Hauran and the Damascus-Beirut railways.

AFRICA.

Algerian Sahara. *A travers le Monde, Tour du Monde* 5 (1899): 221–223. **Combes.**
La Question du Transsaharien. Par Paul Combes. *With Map.*

British South Africa. ——
Rhodesia.—(1889–1899). London: Simpkin & Co. Size 7½ × 9½, pp. vi. and 52. *Maps and Illustrations. Price* 1*s. Presented by the British South Africa Company.*

A collection of photographs of British South Africa, illustrative of the resources and progress of the territory.

British South Africa—Rhodesia. **Brown.**
On the South African Frontier: the Adventures and Observations of an American in Mashonaland and Matabeleland. By William Harvey Brown. London: Low & Co., 1899. Size 8½ × 6, pp. xxii. and 430. *Maps and Illustrations. Price* 12*s.* 6*d. Presented by the Publishers.*

The early chapters of this book deal with a scientific excursion to various ports in West Africa, but the bulk of the work is occupied by experiences in Rhodesia during the Matabele war. The author is an American, but took an active part against the rebellious natives, and gives his views as to the future of the country.

Cape Verd Islands. *B.S.G. Italiana* 12 (1899): 302–312. **Fea.**
Dalle Isole del Capo Verde. Del Leonardo Fea. *With Illustrations.*

Congo. *B.S.G. Rochefort* 21 (1899): 38–49. **Besson.**
Ma captivité chez les nègres du Congo (Mars à Juin 1792). Par M. Besson.

Egyptian Sudan. *Scottish G. Mag.* 15 (1899): 480–483. **Milne.**
Notes from the Equatorial Province. By A. D. Milne.

French West Africa. *B. Comité l'Afrique Française* 9 (1899): 293–298. **Macland.**
A travers la Guinee et la Fouta-Diallon: La mission Maclaud. *With Portrait and Map.*

French West Africa. *Rev. Française* 24 (1899): 587-591. **Montell.**
La Région Française du Tchad. Par M. A. Montell.

German East Africa. *Deutsches Kolonialblatt* 10 (1899): 124-131. ——
Bericht über eine Expedition nach Magalla, Ntussu, Nassa, Usohaschi bis zum 1. Grad südlicher Breite.

German East Africa. *Deutsches Kolonialblatt* 10 (1899): 6-12. ——
Bericht über einen Zug nach Ruanda.

German East Africa. *M. Deutsch. Schutzgeb.* 12 (1899): 168-173. **Herrmann.**
Der geologische Aufbau des deutschen Westufers des Victoria-Nyansa. Von Hauptmann Herrmann. *With Map.*

North-East Africa. *B.S. Khédiv. G.* 5 (1899): 133-161. **Castro.**
De Zeilah au Harar. Notes de voyage du Dr. Lincoln de Castro.

The expedition left Zeila in October, 1896.

Portuguese East Africa. **Belcher and Greville.**
Trade of Mozambique and Quilimane for the year 1898. Foreign Office, Annual No. 2221, 1899. Size 9½ × 6½, pp. 14. *Price* 1*d.*

Portuguese East Africa. **Ross.**
Trade of Lourenço Marques and District for the year 1898. Foreign Office, Annual No. 2235, 1899. Size 9½ × 6, pp. 28. *Price* 2*d.*

Sierra Leone. *J.R. United Service I.* 43 (1899): 534-542. ——
The Sierra Leone Protectorate Expedition, 1898-1899. By one who was there. *With Sketch-maps.*

Tripoli. **Dickson.**
Trade of Tripoli for the year 1898. Foreign Office, Annual No. 2273, 1899. Size 10 × 6½, pp. 12. *Price* 1*d.*

Tunis. **Johnston.**
Trade and General Progress in Tunis during the year 1898-99. Foreign Office, Annual No. 2279, 1899. Size 10 × 6½, pp. 24. *Plan. Price* 1½*d.*

Uganda—Railway. ——
Report by the Mombasa-Victoria (Uganda) Railway Committee, on the Progress of the Works, 1898-99. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. 18. *Map. Price* 8½*d.*

NORTH AMERICA.

Alaska. *National G. Mag.* 10 (1899): 281-288. **Stanley-Brown.**
Shishaldin as a Field for Exploration. By Joseph Stanley-Brown. *With Sketch-map and Illustrations.*

A note on this paper will appear in the *Journal.*

Alaska Boundary. *Globus* 76 (1899): 105-109. ——
Die zwischen England und den Vereinigten Staaten streitige Alaska-Grenzfrage. *With Illustrations.*

Canada—British Columbia. *Scottish G. Mag.* 15 (1898): 449-462. **Begg.**
Vancouver Island, B.C. By Alexander Begg.

Canada—Sable Island. *Nautical Mag.* 68 (1899): 563-567. **Small.**
To utilize Sable Island. By H. B. Small.

On a proposal to connect Sable island and the mainland of Nova Scotia, 85 miles distant, by Marconi's wireless telegraphy.

Canada—Yukon. **Heilprin.**
Alaska and the Klondike. A Journey to the new Eldorado, with Hints to the Traveller, and Observations on the Physical History and Geology of the Gold Regions, the Condition of and Methods of Working the Klondike Placers, and the Laws governing and regulating Mining in the North-West Territory of Canada. By Angelo Heilprin. New York: D. Appleton & Co.; London: C. Arthur Pearson, Limited. 1899. Size 8 × 5½, pp. x. and 316. *Map and Illustrations. Price* 7*s.* 6*d. Two copies, one presented by the Author, the other by C. Arthur Pearson, Limited.*

A work on Alaska and the Klondike region by so well-known and experienced a traveller as Prof. Heilprin is necessarily of very special value. The visit described

occupied from July to October, 1898, the journey being by the White pass down the upper Yukon to Dawson, and the return was by the Chilkoot Pass, so that practically the whole book applies to the Canadian Yukon. The regulations as to gold-mining and the nature and method of working the mines are fully described.

United States—Illinois. **Wyndham**

Trade of Chicago and District for the Year 1898. Foreign Office, Annual No. 2239, 1899. Size 9½ × 6½, pp. 36. *Price 2½d.*

The curious fact is pointed out in this report that Chicago is now the busiest port in the United States, as estimated both by number of vessels and tonnage entered and cleared; the number of entries in 1898 being 9575 compared with 7305 for New York and 1056 for San Francisco.

United States—Illinois. **Leverett**

The Pleistocene Features and Deposits of the Chicago Area. By Frank Leverett. The Chicago Academy of Sciences. Bulletin No. II. of the Geological and Natural History Survey, 1897. Size 9½ × 6½, pp. 86. *Map and Illustrations. Presented by the Chicago Academy of Sciences.*

United States—Maryland. **James**

The Labadist Colony in Maryland. By Bartlett B. James, PH.D. Johns Hopkins University Studies in Historical and Political Science. Series XVII. No. 6. Baltimore, 1899. Size 10 × 6½, pp. 46.

The Labadists were a Dutch sect who emigrated to Maryland in the early part of the seventeenth century in order to practise their tenets in peace.

United States—Michigan. *American J. Sci.* 8 (1899): 31–34. **Mudge**

Mouth of Grand River. By E. H. Mudge.

On some interesting relations of the glacial valley of Grand river, Michigan, to its present mouth.

United States—Montana. *B. American G.S.* 31 (1899): 199–216. **Kimball**

The Granites of Carbon County, Montana: A Division and Glacier Field of the Snowy Range. By James P. Kimball. *With Sketch-map and Plates.*

United States—New York. *B. Geolog. S. America* 9 (1898): 183–210. **Brigham**

Topography and Glacial Deposits of Mohawk Valley. By Albert Perry Brigham. *With Maps.*

United States—New York State. *B. American G.S.* 31 (1899): 217–235. **Tarr**

Physical Geography of New York State. By Ralph S. Tarr. Part viii.—The Great Lakes and Niagara. *With Maps.*

United States—Oregon, Idaho, and Washington. ———

Trade of the States of Oregon, Idaho, and Washington for the year 1898. Foreign Office, Annual No. 2295. 1899. Size 10 × 6½, pp. 48. *Price 2½d.*

CENTRAL AND SOUTH AMERICA.

Andes. *Alpine J.* 19 (1899): 509–523. **Conway.**

Climbs in the Andes in 1898. By Sir Martin Conway. *With Illustrations.*

Argentine Republic. *B.A. Nac. Ci. Cordoba* 16 (1899): 33–48. **Doering.**

Resultados Hipsométricos de Algunos Viajes del Doctor G. Bodenbender calculados por Oscar Doering.

On the altitudes determined by Dr. Bodenbender and particulars as to the aneroids he employed.

Argentine Republic—Cordoba. *B.A. Nac. Ci. Cordoba* 16 (1899): 49–115. **Doering.**

De Soto á Villa Mercedes. Determinaciones barométricas de alturas por Oscar Doering.

Argentine Republic—Cordoba. *B.A. Nac. Ci. Cordoba* 16 (1899): 5–32. **Doering.**

Alturas. Tomadas en la provincia de Córdoba. Por Oscar Doering.

On the determination of altitudes in the province of Cordoba.

Brazil. *Export* 21 (1899): 346, 347, 355, 356. ———

Die Bahnen Neu-Hamburg—Caxias und Neu-Hamburg—Torres. (Originalbericht aus Südbrasilien.)

Brazil. *J. Manchester G.S.* 14 (1898): 321–354. **Boraston.**

Brazil in 1898. By John Maclair Boraston.

Brazil—Amazonas. **Nery.**
Le Pays des Amazones, l'El-Dorado, les Terres à Caoutchouc. Par le Baron de Santa-Anna Nery. Paris: Guillaumin et Cie., 1899. Size 11 × 7½, pp. xxxvi. and 420. *Map and Illustrations. Presented by the Author.*

A new edition of a work which appeared originally in 1884, taking account of the vast advances which have been made in the province of Amazonas in consequence of the development of the indiarubber trade and from other causes.

Brazil—Para. **Santa Rosa and Fidanza.**
Album do Pará em 1899. Parte descriptiva do Dr. Henrique Santa Rosa, Photographias e composição de F. A. Fidanza. Size 16½ × 12, pp. 160. *Maps and Illustrations. Presented by the Brazilian Minister.*

A large selection of views of the province of Para, with official statistics. The text is given in Portuguese, Italian, and German.

Chile. *B.S.G. Paris* **18**, 1897 (1899): 473–495. **Latrille.**
Notice sur le territoire compris entre Pisagua et Antofagasta, avec la région des hauts plateaux boliviens. Par M. Roch Latrille. *With Map.*

Patagonia. *B.S.G. Com. Paris* **20** (1898): 626–643. **Vaulx.**
A travers la Patagonie, du Rio Negro au détroit de Magellan. Par M. Henry de la Vaulx.

Peru. *B.S.G. Lima* **7** (1898): 441–464; **8** (1898): 62–81. **Basadre.**
Provincia de Yauyos. Por el Ingeniero Ricardo Rey y Basadre.

Peru. *B.S.G. Lima* **8** (1898): 81–104. **Osambela.**
Diccionario Oriental del Perú. Por el doctor Claudio Osambela.

Peru. *B.S.G. Lima* **8** (1898): 1–62. **Raimondi.**
Itinerario de los viajes de Raimondi en el Perú: Cuzco., Valle de Lares, Santa Ana y regreso por Mollepata y Limatambo (1865).

Peru. **St. John.**
Trade and Finances of Peru for the year 1898. Foreign Office, Annual No. 2298, 1899. Size 10 × 6½, pp. 34. *Price 2½d.*

A new cart-road is being constructed for 90 miles, from Cuzco along the valley of the Vilcanota to Sicuani, and is already opened for traffic halfway.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia—Discovery. **Heeres.**
The Part borne by the Dutch in the Discovery of Australia, 1606–1765. By J. E. Heeres, LL.D. Published by the Royal Dutch Geographical Society in commemoration of the Twenty-fifth Anniversary of its Foundation. London: Luzac & Co., 1899. Size 14 × 10, pp. xviii. and 106. *Maps. Presented by the Royal Dutch Geographical Society.*

On the part played by Dutch navigators in the discovery of Australia.

British New Guinea—Vegetation. *P.R.S. Queensland* **14** (1899): 14–20. **Bailey.**
Notes on the Vegetation of New Guinea. By F. Manson Bailey.

Caroline Islands. *G.Z.* **5** (1899): 545–562. **Kirchhoff.**
Umrisse zu einer Landeskunde der Karolinen. Von Prof. Dr. A. Kirchhoff.

Caroline Islands. *Globus* **76** (1899): 37–52. **Singer.**
Die Karolinen. Von H. Singer. *With Maps and Illustrations.*

German New Guinea. *Deutsche Kolonialzeitung* **16** (1899): 245–428. ———
Ueber Kaiser-Wilhelmsland. *With Illustrations.*

New South Wales. **Bladen.**
Historical Records of New South Wales. Vol. vi. King and Bligh, 1806, 1807, 1808. Edited by F. M. Bladen. Sydney, 1898. Size 9 × 6, pp. lxxvi. and 876. *Maps, Portraits, and Illustrations. Presented by the New South Wales Government.*

This volume deals with the important period of the governorships of King and Bligh, and is illustrated with reproductions of coloured prints and a number of facsimile letters.

Society Islands. **Simons.**
Trade of the Society Islands for the year 1898. Foreign Office, Annual No. 2293, 1899. Size 9½ × 6½, pp. 10. *Price 1d.*

South Australia—Tides. **Chapman and Inglis.**
Rep. Australasian Assoc. 7 (1898): 241–244.
The Tides of South Australia. By R. W. Chapman, M.A., and Captain A. Inglis. *With Diagram.*

Tonga. **Leefe.**
Trade of Tonga for the year 1898. Foreign Office, Annual No. 2267, 1899. Size 10 × 6½, pp. 8. *Price ½d.*

Victoria. ———
Abstract of the Statistics of Victoria 1893 to 1898. Melbourne. Size 8½ × 5½, pp. 38.

Victoria—Cloud Observations. *Rep. Australasian Assoc.* 7 (1898): 259–265. **Baracchi.**
Cloud Observations in Victoria. By P. Baracchi, F.R.A.S. *With Plates.*

Western Australia. **Blatchford.**
Western Australia: Geological Survey. Bulletin No. 3. The Geology of The Coolgardie Goldfield. By Torrington Blatchford. Perth, 1899. Size 8½ × 5½, pp. 98. *Map and Diagram. Presented by the Government Geologist, W. Australia.*
This report contains a geological map showing the gold workings and wells.

Western Australia—Botany. *J. Linnean S., Botany* 34 (1899): 171–261. **Moore.**
The Botanical Results of a Journey into the Interior of Western Australia. By Spencer Le Marchant Moore.

POLAR REGIONS.

Antarctic. *National G. Mag.* 10 (1899): 316–319. **Grosvenor.**
Plans for reaching the South Pole. By Gilbert H. Grosvenor. *With Map.*

Antarctic. *L'Esplorazione Com.* 14 (1899): 20–23, 122–125, 157–159, 186–189. **Pini.**
Spedizioni polari antartiche. E. Pini.

Antarctic—Drift-ice. *Ann. Hydrographie* 27 (1899): 398–402. **Dinklage.**
Treibeis in südlichen Breiten. Von L. E. Dinklage.

Antarctic—Historical. *T.R.G.S. Australasia (Victoria)*: 16 (1898); 15–27. **Morris.**
Terra Australis Incognita. By Prof. Morris, LITT.D. *With Facsimile Maps.*

Greenland and Iceland. ———
Meteorologiske Middeltal og Extremer for Færøerne, Island og Grønland. Eléments météorologiques des îles Féroé, de l'Islande et du Groenland. Appendix til det danske meteorologiske Instituts Aarlog 1895, II. Del. Kjøbenhavn, 1899. Size 10½ × 8½, pp. 30. *Map. Presented by the Danske Meteorologiske Institut.*

MATHEMATICAL GEOGRAPHY.

Latitude Determinations. *Ann. Hydrographie* 27 (1899): 413–418. **Fulst.**
Ueber das sogenannte "Pagelsche Verfahren." Von Dr. O. Fulst.

Nautical Astronomy. *Nautical Mag.* 68 (1899): 526–540. **Goodwin.**
The Simplification of Formulæ in Nautical Astronomy. By H. B. Goodwin.

Time and Longitude. *Rev. Française* 24 (1899): 576–586. **Cugnin.**
L'Heure et la Longitude Universelles. Par M. E. Cugnin.

Time and Prime Meridian. *Riv. G. Italiana* 6 (1899): 457–480. **Rajna.**
Una discussione su l'unificazione del calendario: il meridiano iniziale per le longitudini e l'ora universale. [Michele Rajna.]

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Lakes. *J.G. Tokyo G.S.* 11 (1899): 275–291, 378–387. **Tanaka.**
Temperature of Lakes and their Classification. By Akamaro Tanaka. [In Japanese.]

Meteorology. **Davis.**
The Circulation of the Atmosphere. By Prof. William Morris Davis. (From the *Quarterly Journal of the Royal Meteorological Society*, vol. XXV. No. 110, April, 1899.) Size 10 × 6½, pp. [10]. *Presented by the Author.*

Meteorology—Conference. ——

Proceedings of the Convention of Weather Bureau Officials, held at Omaha, Nebr, October 13–14, 1898.—U.S. Department of Agriculture. Weather Bureau. Bulletin No. 24. Washington, 1899. Size 9 × 6, pp. 184. *Illustration.*

This conference dealt with a number of topics relating to weather prediction and practical meteorology.

Mountain-structure. *G.Z.* **5** (1899): 563–579. **Frech.**

Ueber die Gebirgsbildung im paläozoischen Zeitalter. Von Prof. Dr. Fritz Frech. *With Plate.*

Oceanographical Apparatus. *C. Rd.* **129** (1899): 243–245. **Charbonnier and Galy-Aché.**

Sur un bathymètre fondé sur l'emploi de cylindres crushers. Note de MM. Charbonnier et Galy-Aché.

Oceanography. *Z. Ges. Erdk. Berlin* **34** (1899): 75-192. **Chun, Schott, and Sachse.**

Die Deutsche Tiefsee-Expedition. A. Berichte des Leiters der Expedition Prof. Dr. Chun. B. Berichte des Oceanographen der Expedition Dr. Gerhard Schott. C. Bericht des Navigations-Offiziers der Expedition Walter Sachse. *With Maps, Diagrams, etc.*

Oceanography. *Scottish G. Mag.* **15** (1899): 416–421. ——

The Effect of Ice-melting on Oceanic Circulation.

Oceanography. *C. Rd.* **129** (1899): 9–15. **Gautier.**

Examen de l'eau de mer puisée à différentes profondeurs; variations de ses composés iodés. Note de M. Armand Gautier.

Oceanography. **Murray.**

On the Temperature of the Floor of the Ocean and of the Surface Waters of the Ocean. By Sir John Murray, K.C.B., F.R.S., etc. From the *Geographical Journal* for July, 1899. Size 10 × 6½, pp. 18. *Maps.*

Oceanography. **Natterer and Pott.**

Berichte der Commission für oceanographische Forschungen. Expedition S.M. Schiff "Pola" in das Rothe Meer, Nördliche Hälfte (Octobre 1895—Mai 1896) IX. Chemische Untersuchungen ausgeführt von Dr. Konrad Natterer. Wien: Carl Gerold's Sohn, 1898. Size 12½ × 10, pp. 128. *Maps and Illustrations. Presented by the Author.*

Ditto: Beschreibender Theil, verfasst von Paul Edler von Pott. Wien: C. Gerold's Sohn, 1898. Size 12 × 9½, pp. 56. *Maps and Illustrations. Presented by the K. Akademie der Wissenschaften, Wien.*

Oceanography. *Ann. Hydrographie* **27** (1899): 274–276. **Schott.**

Nachtrag zu Heft V. (Seite 227 bis 236). Dr. Schott: von der deutschen Tiefsee-Expedition. *With Diagram.*

Dr. Schott gives a table comprising all the soundings of the *Valdivia* expedition, with the positions and bottom temperatures, a selection of some of the more interesting serial temperature-soundings, and a curve showing the typical antarctic and tropical vertical distribution of temperature.

Oceanography. ——

The Danish Ingolf-Expedition. Vol. i. part i.—(1) C. F. Wandel: Report of the Voyage; (2) Martin Knudsen: Hydrography. Vol. ii. part i.—(1) Chr. Lütken: The Ichthyological Results; (2) Hector F. E. Tungersen: On the Appendices Genitales (Claspers) in the Greenland Shark, *Somniosus microcephalus* (Bl. Schn.), and other Selachians. Vol. iii. part i.—Fr. Meinert: Pycnogonida. Published . . . by the direction of the Zoological Museum of the University. Copenhagen: H. Hagerup, 1899. Size 13½ × 10½, pp. (i. 1) 162; (ii. 1) 40 and 88; (iii. 1) 72. *Maps and Plates. Presented by the Zoological Museum, Copenhagen.*

Oceanography—Fisheries. **Lavieuville and Pérard.**

Congrès International de Pêches Maritimes d'Ostréiculture et d'Aquiculture marine réuni à Dieppe du 2 au 6 Septembre, 1898. Par l'Enseignement professionnel et technique des Pêches Maritimes avec le concours du Département, de la Ville et de la Chambre de Commerce de Dieppe. Comptes Rendus des Séances publiés par les secrétaires généraux Gustave Lavieuville et Joseph Pérard. Paris: A. Challamel, 1899. Size 10 × 6½, pp. xxviii. and 434. *Illustrations. Presented by O. T. Olsen, Esq.*

Mr. Olsen attended the International Fisheries Congress as representative of the Royal Geographical Society. Some of the articles are specially noticed.

Oceanography—Marine Fauna. **Thompson.**

On a supposed Resemblance between the Marine Faunas of the Arctic and Antarctic Regions. By D'Arcy Wentworth Thompson, C.B. Reprinted from the *Proceedings of the Royal Society of Edinburgh*. 1898. Size 9 × 5½, pp. 311–349. *Presented by the Author.*

Prof. D'Arcy Thompson here states the case against the assumption that the identity of arctic and antarctic faunas is striking enough to require a theoretical explanation.

Oceanography—North Sea. **Buchan.**

Tidal Currents of the North Sea. By Alexander Buchan, LL.D., F.R.S. Reprinted from the *Proceedings of the Royal Society of Edinburgh*. 1899. Size 9 × 5½, pp. [4]. *Presented by the Author.*

Oceanography—Pacific Ocean. *Science* 9 (1899): 796-798. **Smith.**

Exploring Expedition to the mid-Pacific Ocean. By Dr. Hugh M. Smith.

This is noticed in the *Journal* for July, p. 96.

Seismology. *Atti R. A. Lincei, Rendiconti* 8 (1899): 3–12. **Riccò.**

Riassunto della sismografia del terremoto del 16 novembre 1894. Parte 1ª. Intensità linee isosismiche, registrazioni strumentali. Nota del Corrispondente A. Riccò. *With Map.*

Terrestrial Magnetism. **Bauer.**

Vertical Earth-Air Electric Currents. By L. A. Bauer. From *Terrestrial Magnetism*, March, 1897. Size 9½ × 7, pp. 11–22. *Presented by the Author.*

Terrestrial Magnetism. *Atti R. A. Lincei, Rendiconti* 8 (1899): 529-534. **Bellagamba.**

Sull' influenza della pressione barometrica nelle determinazioni della componente orizzontale del magnetismo terrestre. Nota del dott. G. Bellagamba.

On the influence of barometric pressure in determining the horizontal component of magnetic force.

Terrestrial Magnetism. *Terrestrial Magnetism* 4 (1899): 105–112. **Eschenhagen.**

Ueber einige Probleme des Erdmagnetismus und die Nothwendigkeit einer Internationalen Organisation. Von M. Eschenhagen.

Terrestrial Magnetism. *Terrestrial Magnetism* 4 (1899): 113-129. **Rücker.**

The Secondary Magnetic Field of the Earth. By A. W. Rücker.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. **Herbertson.**

Man and his Work, an Introduction to Human Geography. By A. J. Herbertson, PH.D., and F. D. Herbertson, B.A. London: A. and C. Black, 1899. Size 7 × 5, pp. viii. and 118. *Price 1s. 6d. Presented by the Publishers.*

In this little book Dr. and Mrs. Herbertson present in a popular form the principles of Anthropogeography, laying stress on the influence of geographical environment on the manner of life and political organization of the races of mankind.

Anthropology—Jews. *Globus* 76 (1899): 21-27. **Ripley.**

Ripley über die Anthropologie der Juden. *With Illustrations.*

Historical. *T.R.G.S. Australasia (Victoria)* 16 (1898): 28-37. **Wright.**

Vasco da Gama and his Companions; and Discoveries by the Portuguese in Asia and Africa. By A. J. Wright.

Historical. Ancient Greeks. *B.S.G. Madrid* 41 (1899): 129-155. **Garofalo.**

Estudios de Historia griega. Por Francesco P. Garofalo. El Occidente según los antiguos escritores griegos.

On the knowledge of Western countries possessed by the ancient Greeks.

BIOGRAPHY.

Howell. *Geolog. Mag.* 6 (1899): 433-437.

Eminent Living Geologists: Henry H. Howell, F.G.S., formerly Director of the Geological Survey of Great Britain. *With Portrait.*

Neumayer. *Terrestrial Magnetism* 4 (1899): 203. ———
Biographical Sketch of Prof. George Neumayer. *With Portrait.*

Odierna. **Licitra.**
Dott. Angelo Licitra. Studio su la Vita e su le Opere di Giovanni-Battista Odierna, Astronomo-Matematico e Naturalista Ragusano. Ragusa, 1899. Size 9½ × 6, pp. 184. *Portrait. Presented by the Author.*

The mathematician and astronomer Odierna was born at Ragusa in 1597, and died in 1660. A bibliography of his writings and those of commentators is given, extending from the year 1628 to 1882, and comprising 63 entries.

Pomba. ———
Pio Ricordo di Cesare Pomba. Size 10 × 6½, pp. 32. *Portrait and Map. Presented by Madame Pomba.*

GENERAL.

Applied Geography. *J. Manchester, G.S.* 14 (1898): 264–285. **Herbertson.**
Report on the Teaching of Applied Geography. By Dr. A. J. Herbertson.

Bibliography of Geography. **Raveneau.**
Bibliographie géographique annuelle, 1898.—Annales de Géographie, No. 41, 8e Année, 15 Septembre 1899. Paris: A. Colin et Cie. Size 10 × 6½, pp. 304.

This admirable bibliography keeps up its character for careful selection and terse characterization of the geographical work of the preceding year.

Educational. *J. Manchester G.S.* 14 (1898): 286–292. **Herbertson.**
The Position of Economic Geography in Education. By Dr. A. J. Herbertson.

Educational. *Rev. Scientifique* 12 (1899): 236–241. **Picard.**
L'enseignement rationnel de la géographie. Par M. E. Picard.

Refers mainly to Prof. de Lapparent's views.

Geographical Exhibition. *Riv. G. Italiana* 6 (1899): 14, 119, 222, 368, 422. **Frescura.**
La Geografia all' Esposizione di Torino pel Prof. Bernardino Frescura.

Health – Scurvy. **Beadnell.**
On the Decline of Scurvy afloat. Being a Paper read before the Hong Kong Branch of the British Medical Association, February, 1899. By Surgeon C. Marsh Beadnell, R.N. Size 8½ × 5½, pp. 16. *Presented by the Author.*

The author points out that the cause of scurvy is the reduced alkalinity of the blood, and shows that the effect of fresh vegetables or freshly killed meat is to increase the alkalinity and remove the conditions of the disease. In the arctic regions fresh meat has this effect long after it has been killed, on account of the preservative effect of low temperature.

Irrigation. *Science* 9 (1899): 798–799. **True.**
The Scientific Study of Irrigation. By Dr. A. C. True.

Missionary Reports. ———
Report of the year 1898 of the Society for the Propagation of the Gospel in Foreign Parts. London, 1899. Size 8½ × 5½, pp. 218. *Maps.*

This report contains a map of the world, showing the Anglican missionary dioceses of the English and American churches.

Oriental Literature. **Müller**
The Sacred Books of the East, . . . edited by F. Max Müller. Vols. 43 and 47. Oxford: the Clarendon Press, 1897. Size 9 × 6, pp. (vol. 43) xxviii. and 410; (vol. 47) xlviii. and 186. *Presented by the Secretary of State for India.*

Polynesian Geography. *Rep. Australasian Assoc.* 7 (1898): 801–816. **Smith.**
The Geographical Knowledge of the Polynesians. By S. Percy Smith. Part ii. *With Map.*

Southampton Geographical Society. ———
Southampton Geographical Society's Report, 1898. Southampton, 1899. Size 8½ × 5½, pp. 32. *Map.*

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**

Publications issued since September 8, 1899.

6-inch—County Maps:—

England and Wales (revision):—**Cheshire**, 6 N.W., N.E., S.W., 8 S.E., 9 N.W., S.W., S.E., 10 S.E., 11 N.W., N.E., 12 N.W., 19 N.E., S.E., 20 N.W., 22 S.E., 23 N.W., 24 S.W., 25 S.W., S.E., 27 N.E., S.E., 28 N.W., N.E., S.E., 29 N.W., N.E., S.W., 31 N.W., S.W., 32 S.W., S.E., 33 complete, 34 N.W., 36 N.E., 38 N.W., N.E., 39 N.W., 40 N.E., S.W., 46 N.W., N.E., S.W., 47 N.W., N.E., S.W., 48 N.E., S.W., 49 N.E., 53 N.E., 54 N.E., S.W., 55 N.W., S.W., 60 N.W., S.W., S.E., 61 N.W., S.E., 64 N.E. **Derbyshire**, 5 N.E., 6 S.W., 8 N.E., 13 S.W., 14 S.E., 25 N.W., 26 S.E. **Sussex**, 33 N.W. 1*s. each.*

25-inch—Parish Maps:—

England and Wales (revision):—**Berkshire**, II. 5; XIII. 2, 7, 11, 12; XIV. 1, 2, 3, 4, 5, 6, 7, 8, 11, 13, 15, 16; XV. 9, 10, 13, 15; XXI. 5, 7, 9, 13, 14; XXVII. 1, 3, 4, 5, 6, 7, 9, 10, 11, 12, 15, 16; XXVIII. 16; XXXVI. 1, 5, 6, 7, 8, 9, 12, 14, 15, 16; XXXVII. 12, 16; XLV. 3, 6; XLVI. 1, 5, 16; XLVII. 5, 9. **Bucks**. XXII. 2, 6, 15; XXVI. 16; XXVII. 13, 14, 15, 16; XXVIII. 6, 7, 8, 11, 12; XXIX. 1, 2, 4, 5, 8, 10, 12; XXX. 13; XXXII. 4; XXXIV. 7, 12; XXXVIII. 1. **Cheshire**, XLIV. 10, 11, 13, 14. **Cumberland**, LXI. 12, 16; LXII. 9, 10, 13, 15; LXIII. 6, 8, 9; LXIV. 4, 5, 7, 8; LXV. 1, 2, 3, 4, 8, 11; LXVI. 1, 5; LXVII. 4, 15, 16; LXVIII. 3. **Denbighshire**, II. 13; IV. 12, 16; V. 2; VIII. 2, 4, 6, 7, 11, 12, 14, 16; XIII. 2, 3, 6, 7, 11, 12; XIV. 2, 9; XV. 15; XX. 1, 4; XXI. 7; XXVII. 6, 10, 14, 15; XXVIII. 4, 15; XXXIV. 3, 8, 11, 12; XXXV. 1, 3, 5, 7, 16; XXXVIII. 15; XXXIX. 2, 3, 13; XL. 4. **Flintshire**, I. 10, 13, 15; IV. 2, 4, 7; VI. 1; VII. 4; XIII. 2, 15; XIV. 5; XVII. 1, 7; XXV. 1. **Glamorganshire**, XVI. 9; XVII. 2, 4, 14; XXXIII. 5, 15, 16; XXXIV. 11; XL. 2, 7, 12, 16; XLI. 16; XLV. 1, 4, 7, 10, 11, 12, 13, 14, 15, 16; XLIX. 1, 3, 4, 8. **Oxfordshire**, XIX. 16; XX. 13, 14; XXVII. 9, 10; XXXIII. 5, 10, 16; XXXIV. 13. **Staffordshire**, I. 13; III. 8; IV. 1, 5; VI., 11, 12, 13, 14; VII. 5, 9; IX. 16; X. 8; XI. 1, 2, 3, 5, 7, 9; XII. 1, 7, 10, 11. **Sussex**, LIV. 14; LVIII. 9, 11, 13, 15, 16; LIX. 9, 10; LXXI. 1, 3, 4, 5; LXXVIII. 3, 6, 7, 8, 11, 12; LXXIX. 6; LXXX. 9, 10; LXXXIII. 1. 3*s. each.*

(*E. Stanford, Agent.*)

Germany. **Königl. Preuss. Landes-Aufnahme.**

Karte des Deutschen Reiches. Herausgegeben von der Kartogr. Abtheilung der Königl. Preuss. Landes-Aufnahme, 1899. Sheets 283, Osnabrück: 285, Minden; 286, Hannover. Scale 1 : 100,000 or 1·6 stat. mile to an inch. *Price* 1.50 *marks each sheet.*

AMERICA.

Suriname. **Loth.**

Kaart van Suriname. Naar de opmetingen van J. F. A. Cateau van Rosevelt en J. F. A. E. van Lansberge, aangevuld tot 1898 met die van—en geteekend door W. L. Loth, Gouvernements-Landmeter in Suriname. Eerbiedig opgedragen aan H. M. de Koningin der Nederlanden. Scale 1 : 500,000 or 7·9 stat. miles to an inch. J. H. de Bussy, Amsterdam, 1899. *Presented by the Publisher.*

On this map are shown all means of communication, the agricultural conditions of the country, the character of the soil, and the general physical features.

GENERAL.

World. **Bartholomew.**

Bartholomew's Physical Atlas—Vol iii., Atlas of Meteorology. A series of over 400 maps, prepared by J. G. Bartholomew, F.R.S.E., and A. J. Herbertson, PH.D., and edited by Alexander Buchan, LL.D., F.R.S., under the patronage of the Royal Geographical Society. Prepared at the Edinburgh Geographical Institute, and published by Archibald Constable & Co., Westminster, 1899. *Price* £2 12*s.* 6*d.* *Presented by the Publishers, and by Messrs. J. Bartholomew & Co.*

This is the first issue of an important physical atlas in course of publication, of which it forms the third volume, and is in itself a complete meteorological atlas. It may be referred to with confidence on all subjects connected with the distribution of temperature, barometric pressure, clouds, sunshine, and rainfall, as well as matters

connected with winds and storms; much interesting information being given on these subjects.

The atlas contains more than four hundred beautifully executed maps, and, considering the vast amount of work entailed in the compilation, is remarkably cheap at the price at which it is offered to the public.

A separate notice of the important atlas of which this volume forms part, will be published in the *Geographical Journal*.

World. **Meyer.**

Meyer's Hand-Atlas. Zweite, neubearbeitete und vermehrte Auflage mit 112 Kartenblättern, 9 Textbeilagen und Register aller auf den Karten verzeichneten Namen. Parts 23 and 24 (in one) and 25 and 26 (in one). Leipzig und Wien. Verlag des Bibliographischen Instituts, 1899. *Price 60 pf. each issue.*

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, July and August, 1899. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.	
3061 to 3072		Tidal streams:—North sea. 4*d. each* The same twelve charts bound together in an atlas. 5*s.*
114c	m = 3·95	Scotland, east coast, River Forth:—Port Edgar to Carron river. 2*s.* 6*d.*
3086	m = 5·1	Newfoundland, east coast:—Cat arms (White bay). 2*s.* 6*d.*
2470	m = {3·55, 1·70}	Plans on the east coast of North America:—Connecticut river, New Bedford harbour. 1*s.* 6*d.*
3107	m = 0·25	Brazil, east coast:—Cape St. Thomé to Guaratiba point. 2*s.* 6*d.*
1309	m = var.	Plans on the east coast of Patagonia:—Port Desire, Port Desire with a sketch of the river, Port Gallegos anchorage, Port and river Gallegos, Sea Bear bay (reproduction). 1*s.* 6*d.*
3094	m = 1·7	Central America, west coast:—Jiquilisco bay (Port el Triunfo). 1*s.* 6*d.*
3093	m = 5·8	Anchorages on the west coast of Africa:—Sekondi bay. 1*s.* 6*d.*
3115	m = 1·95	Africa, west coast:—Forcados river entrance 1*s.* 6*d.*
3085	m = 7·85	Mauritius:—Tombeau and Arsenal bays. 1*s.* 6*d.*
3087	m = 7·85	Mauritius:—Black river bay. 1*s.* 6*d.*
3003	m = 0·15	Japan:—Ando Zaki to Otose Zaki, including Sado island (Plans:—Tobi Shima anchorage, Sakata harbour, Ogi bay, Kamo harbour, Niigata roadstead). 2*s.* 6*d.*
3097	m = {5·9, 6·0}	Anchorages in the Friendly islands:—Neiafu anchorage and approaches, Ofolanga island and approaches. 1*s.* 6*d.*
3102	d = 2·6	Pacific Ocean:—Hawaii to the parallel of 6° 15′ N. 2*s.* 6*d.*
111		England, east coast:—Farn island to Berwick (New plan:—Holy island harbour).
48		British Columbia:—Skidegate inlet (Plans added:—Kitgoro, Kaisun harbour).
962		Ports in the Philippine islands:—New plan, Port Palanog.
2591		New Zealand:—River Waiau to Cape Foulwind (Plan added:—Westport harbour).

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
114c	River Forth. Queensferry to Stirling.	New chart. River Forth:—Port Edgar to Carron river	114c
2470 2880	Connecticut river. New Bedford harbour.	New sheet. Plans on the east coast of North America	2470
1309	Plans on the east coast of Patagonia.	New sheet. Plans on the east coast of Patagonia . .	1309
536	Sado island.	New chart. Ando Zaki to Otose Zaki	3003

Charts that have received Important Corrections.

No. 1188, the World:—Coal and Telegraph chart. 2151, River Thames:—Broadness to Mucking Light. 109, England, east coast:—Entrance to the river

Humber. 1191, England, east coast:—Flamborough head to Hartlepool. 2046, Ireland, south coast:—Waterford harbour. 1972, Norway, west coast:—Approaches to Trondhjem, eastern sheet. 2309, Norway, west coast:—Leka to Donnæsö. 810, Baltic sea:—Hangö road and approaches. 562, Spain, east coast:—Port of Valencia. 429, Corsica:—Cape Feno to Lava bay. 1942, Prince Edward island:—Bedeque harbour. 2961, Lake Ontario:—Eastern part of the bay of Quinté. 443, Cuba:—Port of Santiago de Cuba. 513, Venezuela:—Puerto Cabello, etc. 574, Chile:—Coquimbo bay and port Herradura. 1923A, British Columbia:—Cape Caution to Port Simpson, northern portion. 1923B, British Columbia:—Cape Caution to Port Simpson, southern portion. 2430, British Columbia:—Queen Charlotte islands. 1500, Alaska:—Kadiak island to Seguam island. 1562, Africa, west coast:—Rivers Nuñez and Componi. 2908, Africa, south coast:—Port Natal entrance. 784, Red sea:—Suez bay. 70, Bay of Bengal. 823, Bay of Bengal:—Koronge island to White point. 2413, China sea:—Rhio strait. 2577, Philippine islands:—Between St. Bernardino and Mindoro straits. 1395, China:—Tinghai harbour and approaches. 532, Japan:—Simonoseki strait. 2511, Russian Tartary:—Strelok bay to St. Vladimir bay. 1674, Australia, east coast:—Brisbane river. 960, Tasmania:—Approaches to Hobart. 2411, New Zealand:—Otago harbour from the entrance to Dunedin. 2421, South Pacific Ocean:—Tonga or Friendly islands.

(*J. D. Potter, Agent.*)

PHOTOGRAPHS.

Luchu Islands. **Clutterbuck.**

Forty-three Photographs of Great Luchu island, taken by W. J. Clutterbuck, Esq. *Presented by W. J. Clutterbuck, Esq.*

This is an interesting set of photographs representing the scenery, dwellings, and natives of the Luchu islands. The following is a list of the subjects:—

(1) One of the five entrances to Shuri Castle; (2) Bridge on the road to Shuri; (3) The first gate at Shuri; (4) The second gate at Shuri; (5) A shop in Shuri; (6) Leading pony to Shuri; (7) Bridge in front of Buddhist temple at Shuri; (8) Female worshippers at a shrine in Shuri; (9) Luchuan boy; (10) Native Luchuan boat; (11) A Luchuan tomb; (12) Luchu sail (made of reeds); (13) Ordinary Luchuan dwelling; (14–16) Luchuan tombs; (17) Native Luchuan ladies; (18) In the town of Naha; (19) Just off the market-place, Naha; (20) Native women in a street at Naha; (21) Leaving the port of Naha; (22) Street at Naha; (23) A woman at Naha; (24, 25) The road from Naha to Shuri; (26) Cast-away earthenware pots made at the potteries about 3 miles from Naha; (27) On the road from Naha to Shuri; (28) Three native children; (29) A native house; (30) Native women; (31) Laden native pony; (32) Our Japanese servant, Masuda, on his pony; (33) Sago palms (*Cycas revoluta*); (34) A native canoe, in which two natives will sometimes go out 20 miles to sea; (35) Two women; (36) Where native paper is made; (37) A coffin; (38) Aomori to be shipped for consumption in other islands of same group; (39, 40) The potteries; (41) Snake's skin (Habu snake) guitar, pewter pots for holding spirit at a funeral, horn spoon for wearing in ladies' hair during mourning, pieces of painted hand-made linen; (42) Gazimaru tree; (43) White glazed earthenware for putting the bones of a dead person in three years after burial.

Transylvania. **Lóczy.**

Five Photographs of Transylvania, taken by Dr. Lóczy, 1891. *Presented by Dr. Lóczy.*

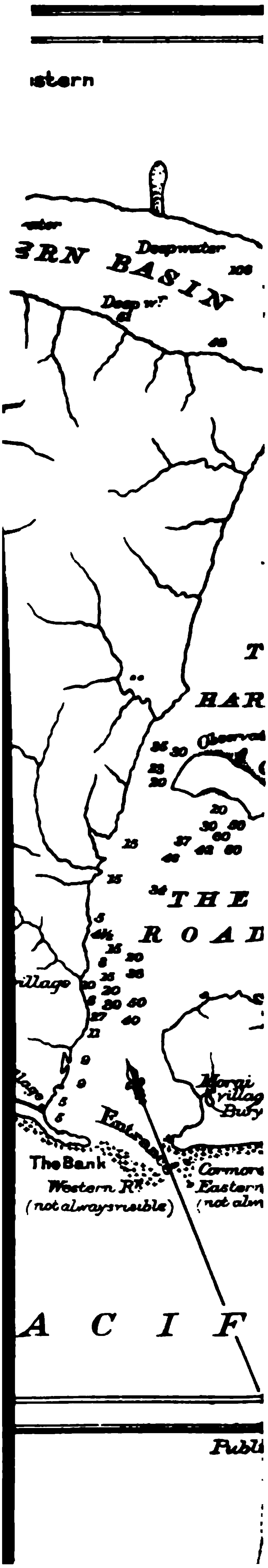
(1) Greek Church of Demsus constructed from the remains of the Roman city of Ulpia-trajan; (2) The Andesite cone of the town of Diva, with ruins of the castle, the river Maros, and the mining hills of Nagyag in the background; (3) Gold-mines of Verespatok; (4) Andesite conglomerates with rain-marks, Josiashely, on the right bank of the river Fehir Korós; (5) Scenery in the South Transylvanian Carpathians, head of the valley of Toijecr, in the Paring group.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

48


40'
2790
rvey
10
20'

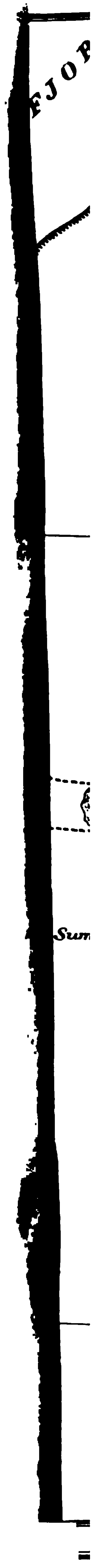
LLUSTRATE TH



LLUSTRATE TH

stern

Publi



RD

nmit of

470

The

Geographical Journal.

No. 6. DECEMBER, 1899. Vol. XIV.

OPENING ADDRESS, SESSION 1899–1900.*

By the PRESIDENT.

Our geographical work, in its different departments, has actively progressed, both in the study and in the field, since the end of our last session; while several important steps have been taken for its advancement.

Our most prominent measure has been one of renunciation. I have resigned the post I have held for the last five years, since 1894, of President of the International Geographical Congress, into the hands of my friend and colleague, Baron Richthofen; and the secretaries have delivered their final report to their successors at Berlin. Dr. Keltie and Dr. Mill well deserve the thanks of all geographers for the zeal and ability with which they have conducted the work of the Congress while it was in our care, from the early part of 1894 until October, 1899. We were received at Berlin with a most hearty and cordial welcome, and the meeting was a great success. Largely assisted by the Government and by the city of Berlin, and furnished with a magnificent building rent-free, the Seventh Congress had advantages which we did not possess, and consequently the officials of the Congress, being better supplied with funds, will certainly be better able to conduct the business, and especially to carry out the resolutions that have been passed.

Turning from these international duties to more domestic concerns, I feel sure that the Fellows will be glad to hear that the School of Geography at Oxford has been established, and is now in working order. It is regulated by a joint committee, consisting of four members of the University and three members of our Council. A lecture-room and

* Read at the Royal Geographical Society, November 13, 1899.

laboratory have been fitted up for it in the old Ashmolean Museum; there is an efficient staff under the direction of Mr. Mackinder, and the course of instruction has commenced this term. We may expect, with some confidence, that there will eventually be valuable results from this joint action on the part of the University and of our Council, for the promotion of geographical education.

The subject catalogue is in an advanced state, and the work of the nomenclature committee is progressing.

Dr. Mill's investigation of the geography of southern Sussex, in connection with the Ordnance map, is practically completed, and we hope to publish it soon as a sample of what might be done with the aid of the Ordnance maps, in working out the detailed geography of our native land, and indicating the influence which it has exerted on the country's history, on distribution of population, on agricultural, industrial, and commercial development. Dr. Mill has also brought out, during the recess, his 'International Geography,' which is certainly the best text-book in the language, and equal to anything produced in Germany.

I must briefly refer to another enterprise, likely to be of great service to geography, to which the Society has given its patronage. I allude to the great physical atlas in several volumes, which Mr. Bartholomew has had in preparation for years, with the assistance of many specialists, and the first volume of which is just issued. Mr. Bartholomew deserves the highest credit for such enterprise, involving a great outlay, and placing this country on a level, at least, with the best work of the kind in Germany or elsewhere.

A fine new large-scale map of Siam is in an advanced state of preparation, and will probably be published next year, with the financial aid of the Siamese Government, accompanied by a detailed memoir by Mr. James McCarthy, to whose many years' labour as Government surveyor the work is due.

We must, I think, all welcome the result of the arbitration on the Venezuelan boundary, because it so fully proves the correctness of the view taken in our *Journal* when the aggression of the Venezuelans made the question a serious one in 1896. The Schomburgk line, dividing British Guiana from Venezuela, is declared to be the correct one. Sir Robert Schomburgk, it will be remembered, was one of our Gold Medallists. His journeys were undertaken with the aid of grants made by our Council, and we have reason to be proud of the learning, judgment, local knowledge, and regard for justice which enabled our associate to delimit a difficult boundary in a way that has won the unanimous assent of the arbitrators.

I have invited M. de Gerlache, the commander of the Belgian Antarctic Expedition, to come to this country and give us an account of his voyage. Our own strenuous efforts to secure the equipment and

despatch of an antarctic expedition on an adequate scale have been rewarded. Thanks to the subscriptions of the Council and Fellows of this Society, above all to the munificence of our associate, Mr. Longstaff, the Government has consented to double the Antarctic Fund, thus raising it to £90,000; provided that we can, from other sources, succeed in raising another £5000. In his answer to our deputation, Mr. Balfour made a most enlightened and appreciative speech, worthy of the best days of educated statesmanship. It reminded me of the times when we had such men as the first Earl of Ellesmere among us. No one, before or since, has taken a greater interest in polar, and especially in antarctic, exploration. Unfortunately, most of Lord Ellesmere's valuable geographical work lies buried in anonymous articles in the *Quarterly Review*. I feel a great veneration for the memory of the most accomplished of our former Presidents, because it was his encouragement which first turned my thoughts seriously to geographical studies, and more especially to the antarctic regions. He used to refer to Ross and Weddell, to Franklin and Parry, as the "Nelsons of Discovery," most justly giving them a place beside those heroes for whose martial deeds he felt such deep admiration. He used to say that death in the cause of science and death on the battle-field were both most noble.

I cannot refrain from referring to the recent death of our former President's grandson at Ladysmith. My young friend, Frederick Greville Egerton, the gunnery lieutenant of the *Powerful*, fell mortally wounded just as he was helping in the performance of a great public service. He fell fighting for his country in a most just and most righteous cause, and his country mourns his loss. It was a death which his grandfather, in common with all true Englishmen, held to be most noble. These are indeed very anxious times, and it is hard to turn our attention away, even for an hour, from the place where many dear friends are fighting so heroically against such heavy odds. We have just received Captain Wellby's paper on his great journey from Abyssinia to Khartum. He himself has joined the 18th Hussars at Ladysmith, and all his friends watch anxiously for good news of him. We shall keep the paper back until he can return to read it himself, when he will receive such a welcome as these four walls have seldom witnessed. Our best geographers are ever to the front when their country needs their services.

We have received other valuable work from Africa since the close of the last session. Mr. Mackinder has reached the summit of Mount Kenya, and has returned to his useful labours at Oxford, after performing what I consider to be a model exploring journey. Mr. Codrington has, in accordance with the wishes of our Council, conveyed through Mr. Sharpe, visited the famous Livingstone tree near Chitambo's. He found it rotting away, but was in time to save a slab, with the inscription, which he will transmit to this country. He has established marks

to fix the place, preparatory to the erection of a permanent memorial to the great traveller, which is in contemplation. Mr. Weatherley, who was the first to send us leaves from the tree, has communicated an interesting account of his more recent travels. We also expect a paper on his travels in Abyssinia from Mr. Weld Blundell.

Nor have our travellers been less active in Asia; and it seems to me that their work strikingly shows us how many limited but exceedingly interesting tracts still remain for young geographical aspirants to explore. Captain Deasy is on his way home after having examined and surveyed a previously unknown part of the course of the river Yarkand. Captain Wingate has sent us some account of his remarkable journey through China to Bhamo; and I have the great pleasure of introducing to you this evening Mr. W. R. Rickmers, who will describe to you his travels in Bokhara.

TRAVELS IN BOKHARA.*

By WILLY RICKMER RICKMERS.

A JOURNEY made three years ago in the eastern provinces of Bokhara induced me to revisit the country. Accordingly in the summer of 1898 I started, accompanied by my wife and Dr. v. Krafft, now of the Geological Survey of India.†

I take this opportunity of thanking the Imperial Government of Russia and its representatives in Bokhara for the facilities afforded me in travelling through the Khanate.‡

An officer of His Royal Highness the Amir accompanied us as guide, his duty being to see that fitting accommodation for ourselves and our horses was provided at the various halting-places on the route. The presence with us of this official was tantamount to a letter of safe-conduct, and assured for us a friendly and courteous reception at the hands of the native officials, with whom we came in contact. As he always sent a messenger in advance to announce our arrival at any station where we intended putting up, we found ample preparations made for our reception. As we approached our destination we were usually met by a crowd of gaily dressed officials, whose white turbans,

* Read at the Royal Geographical Society, November 13, 1899. Map and diagrams p. 696.

† My chief aim was the investigation of certain parts of the province of Baldjuan, which had been neglected by previous travellers.

‡ For permission to visit Bokhara I am indebted to the kindness of the late General Annenkoff, whose encouragement of foreign travel in Transcaspia will make his death a great loss to those who, like myself, have had personal experience of his influence in smoothing away the difficulties under which the foreign traveller in these regions must labour. To the political agent, Mr. Ignatieff, and his secretary, Mr. Miller, I likewise tender my hearty thanks for the unfailing courtesy they showed me, and for the trouble they took in arranging for our comfort during our journey through the country.

brilliant garments, and richly caparisoned steeds recalled some scene out of the 'Arabian Nights.' These, saluting us with true Oriental dignity, escorted us to their houses, where we found provision made for our comfort according to the Bokhariot's idea of a European standard. Thus, though dispensing with tables and chairs himself, he always provides these articles for his guests. Being of native manufacture, they present some truly remarkable features. In very few cases do tables and chairs correspond, and the legs of both are of most uncertain height and stability. If the table is raised some two feet above the ground, the chair generally towers some two feet above that, while if the table is an ordinary size, the chairs are frequently several feet below it. As

BALGNAN.

regards hospitality, the Bokhariot upholds the traditions of Oriental lavishness. The tables literally groaned under the weight of fruits and sweets of every variety. Soup, fowl, and mutton, with rice, the national fare, formed the more substantial part of the repasts, which never varied. In spite of its monotony, this diet did not pall upon us so much as might be expected. The fresh air and constant exercise probably whetted our appetite, in consequence of which we were less fastidious.

As regards our quarters, they were uniformly the best the place offered. The native bedstead, with its mattress of woven rope, can be made a most comfortable resting-place if well covered with wadded quilts and rugs. In the deliciously cool nights of early summer, the

traveller can with safety sleep outside, the dryness of the atmosphere doing away with all danger of chill, while mosquitoes scarcely exist, save in certain localities, and noxious animals are unknown. In autumn the difference of temperature between night and day is too great to admit of sleeping outside, and one has to make the best of the native dwellings. Air is generally to be had in abundance, as the doors seldom fit, and cracks and crannies in the wall provide sporadic ventilation in unexpected quarters. These same crannies afford a hiding-place for certain minute insects, which have a knack of making their presence felt while they themselves manage to remain invisible.

Beyond these minor discomforts, there is little to deter a traveller who enjoys sound health from making a similar journey. Of attacks from the natives there is absolutely no danger. The people are quiet, too much in awe of their rulers to make themselves aggressively disagreeable; and are effusively polite when it is to their interest to be so. That it is possible not merely to travel, but to enjoy the private hospitality of the natives in this interesting country, speaks volumes for the mighty change which has taken place in it since the days when no European dare venture in safety within its borders save, like Vambéry, under cover of a perilous disguise.

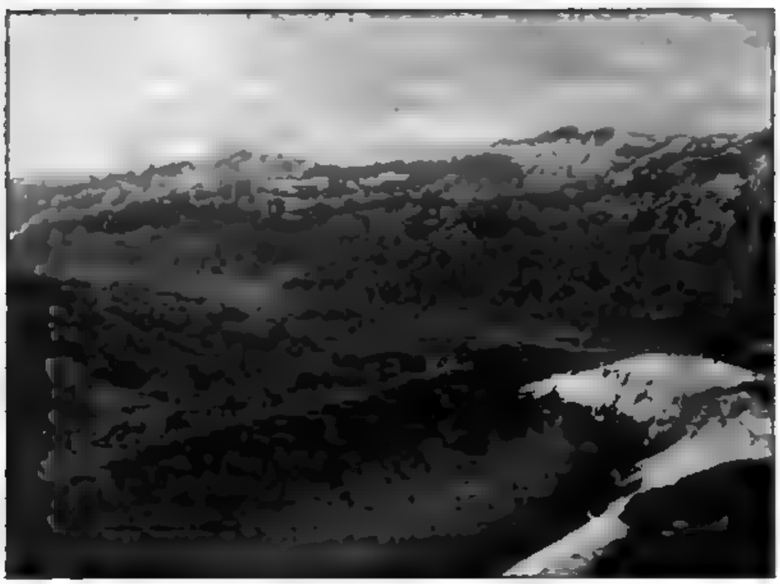
Our little caravan, consisting of some twelve horses, left the famous old Mohammedan metropolis on June 27. The first part of our journey, as far as Karshi, lay along the well-known trade route to the south. Soon after leaving the Russian town of New Bokhara one enters a region of sand-dunes, which, alternating with stretches of steppe, continues as far as Kwaja-Mubarak. There it gives place to partly cultivated steppe until Kazan is reached, where begins the luxuriant belt of gardens surrounding Karshi.

The contrast between this fertile oasis, in which groves of mulberry, apricot, and apple trees refresh the eye, and the dreary desert of the first two days' march can be more easily imagined than described. The traveller in these desolate regions is, however, not without provision for his safety by the way. At Karaul, the first station reached after leaving Bokhara, there is a fine reservoir covered with a large cupola of brickwork. Close by, the ruins of an imposing caravanserai recall the efforts of former rulers to mitigate the dangers of desert travel. These and similar remains elsewhere along the road are ascribed to Abdullah Khan, an Amir of Bokhara during the sixteenth century, and one of the few historic names still lingering in the native memory as associated with the past greatness of the country.

Karshi, the first town at which we halted, boasts a certain antiquity, and, though far inferior to Bokhara in point of interest, exhibits in its bazaar-life similar features to that of the capital. Its beautiful gardens with their rich foliage add a charm to the place which Bokhara has not in the same degree. From the roofs the town appears embosomed in trees.

At Guzar, some 30 miles beyond Karshi, we leave the great Transcaspian plain and reach the first low spurs of that vast expanse of mountains which continues without a break to the great plain of Northern India.

Our approach to higher ground did not bring us that relief from the heat for which we had hoped. The vegetation of the hills at this season is parched and dried up, and the rocky walls of the valleys beat back with redoubled vehemence the fierce glare of the sun. The prominent feature of this belt of outlying hills is the loess. This geological formation dominates the landscape as far as the high alpine regions. Its varied aspects, deep chasms, and steep banks constitute



THE YAKH-SU VALLEY AND CONGLOMERATE MOUNTAINS, FROM THE PASS BETWEEN KHOVALIN AND SARIPUL.

a characteristic scenery of their own. A sea of slippery yellow mud in rain, the source of volumes of impalpable dust in dry weather, it makes itself but too familiar with the clothes, eyes, ears, and mouth of the traveller.

Here and there rocky crests rise out of the undulating loess. Through one of these lies the famous defile known as the Iron Gate, and mentioned by the early Chinese traveller Hiuen-Tsang (about A.D. 630). This remarkable sandstone gorge, which cleaves the mountain from summit to base, is about a mile long, and at times only a few paces in width. Its mighty cliffs, hewn and carved in bizarre fashion, tower in places to a height of 600 feet, and are rendered the more

impressive and picturesque by reason of the windings of the gorge. In the winter a stream flows through the chasm, which is then impassable, and the travellers circumvent it by a path over the mountain.

Passing through Darbend and Baisun, we descended into the swampy valley of the Surkhan, which we followed as far as Karatagh. Here we stayed a few days to give the horses rest.

Karatagh, which lies on the banks of a rushing river at the point where it leaves the Hazrat Sultan mountains, is the summer residence of the Kush-Begi of Hissar, the most important dignitary of the Khanate after the prime minister of Bokhara. He is the governor of the entire eastern half of the Ameer's dominions, and invested with great privileges, having power over life and death. During the winter he lives at the ancient capital of Hissar. At the approach of the warm season, when malaria and mosquitoes render the place almost uninhabitable, he migrates with his goods and chattels and a great part of the population to Karatagh. This biennial exodus almost clears the town, for everybody from the highest official down to the meanest prisoner in the jail follows his master. Not only does the Kush-Begi move all his valuables from one capital to the other, even the lumbering cannon, of which he can muster two or three specimens, are dragged in the train of the hundreds of camels employed for the removal of his household. Many of the animals literally groan under the weight of the bags filled with the hard cash which forms no inconsiderable part of his treasures, while others have the lighter burden assigned them of carrying the numerous inmates of his harem.

While at Karatagh we made an excursion to the Timur-Dera-Kul, a small lake to the north of the town at a height of 8000 feet. We followed the valley of the Karatagh river, which winds through magnificent scenery, precipitous mountains hemming it in in parts. Vegetation, though scarce, was never entirely absent. A species of briony twined itself round the gigantic boulders strewing the river's edge, while willow and mulberry trees frequently occurred. At the village of Khaki-mi we stopped for the night, our quarters being the portico of a mosque, the only shelter available. The scene was a very fine one, the pillars of the mosque serving as a frame to the mountains which towered aloft in front of us, the moonlight turning their snow-crowned summits to sheeted silver.

From Khaki-mi on the following day we rode on to the Timur-Dera-Kul. Here Nature was more prodigal with her gifts than in the parts we had hitherto visited. Round the water the walnut, the mulberry, and the willow abounded, with flowers of every hue and variety akin to many European species. The water is of the most exquisite bluish-green tint.

The lake lies north-east by south-west, and is fed by two streams—the Yangi-lik on the east, and the Ak-tash on the west. The dam at

its lower end is an old moraine, and the overflow produces a pretty cascade. It was in this neighbourhood that we saw the nearest approach to a forest during the whole of our sojourn in Bokhara, for the natives with their primitive tools play havoc with any trees within reach, ruthlessly destroying as many as two or three of them in the attempt to obtain a single plank. Here and there shading their court-yards are to be found venerable trees, generally planes; but these are exceptions, the country as a whole being remarkably bare of the more stately representatives of the vegetable kingdom.

From Karatagh we had each day to struggle over some rugged mountain pass, and we successively crossed the valleys of the Kafirnighan,

A SIDE VALLEY OF THE YAKH-SU.

the Vaksh, and the Kizil-Su. Bridges in this country are few and far between, and the Amir's highway is often deflected for a day's journey owing to their scarcity. Most of these structures, constructed on a primitive form of the cantilever principle, are unable to resist the onrush of the spring floods, and have to be built anew each year. A notable exception is the bridge over the Vaksh. Between Norak, famous for its salt-mines, and Tut-Kaul this river runs through an extremely narrow valley. Here the path skirts the rim of precipices, over which a single false step on the part of the horse would suffice to fling him and his rider into the turbulent waters below.

At the spot where this river, equal in volume to the Thames at Kew,

is pent into a rocky channel 8 feet wide, the native engineers have seen their opportunities. A few beams are sufficient to span the cleft, while a thick hedge of interwoven branches screens the giddy depths from the traveller's eyes. A gate on the bridge marks the frontier between the provinces of Hissar and Baljuan. In ancient times, when constant wars were waged among the minor states, many an expedition must have been frustrated at this point.

Another remarkable phenomenon in the Vaksh valley is to be seen just above Tut-Kaul, on the right bank of the river. This is an embankment of solid rock formed by the outcropping surface of a stratum of limestone. It runs in a perfectly straight line for a distance of several hundred feet, and such is its smoothness and regularity that it looks as if human art had devised it to confine the stream. A few hundred feet vertically above it a deep groove runs along the face of the mountain, marking a former level of the river. It may be termed a classically perfect example of this kind of geological record.

Baljuan, the capital of the province of the same name, was the last town of any pretensions which we passed before we arrived at our destination. It is picturesquely situated on the high banks of the Kizil-Su, the palace of the governor commanding a fine position on the summit of a loess cliff. On market days the population overflows into the river-bed, a vast stony plain reduced to an almost dry state during the summer.

Here, in contrast to the flat mud housetops prevailing in other parts of Bokhara, we have sloping roofs thatched with reeds. The town possesses a native garrison, which entertains the populace with martial music and military evolutions every morning and evening. Their appearance in a garb which strives to imitate Russian military costume has something of the ludicrous about it. It is one of the many illustrations of perversion of taste which contact with Western civilization so often produces in the Oriental. Of a piece with this is the red cotton with which rooms prepared for the reception of Europeans are frequently covered in place of carpets.

Crossing a watershed into the valley of the Yakh-Su, we bade farewell to the regions of sand, steppe, and loess, and entered the sub-alpine level. From the summit of the pass between Khovaling and Saripul we had our first view of that wonderful mountain system of the "conglomerates" of East Bokhara.*

---

* This region has rarely been visited, and I have not been able to find more than a passing remark on the Yakh-Su valley. The reason for this is that the eastern provinces of Bokhara have only in comparatively recent times received the attention of explorers.

The early reports of Hiuen Tsang and of the Buddhist monk Syan-Dzan down to those of Forsyth and Trotter were chiefly based on second-hand information. Then began the great activity in the countries west of the Pamir, and associated with the

Ascending the Yakh-Su valley, we established our headquarters on one of its tributaries—the Safet-Darya (White river), which joins the Yakh-Su just below the village of Talbar, marked on the Russian map, and mentioned by Regel.

The conglomerates cover an area of about 800 square miles, disposed in a long strip between the rivers Vaksh and Panj, with a strike from north-east to south-west. They show distinct stratification. Dr. v. Krafft ascribes them to the tertiary period.* The stones composing them are chiefly crystalline. The greatest thickness of the formation may be said to be at least 4000 feet. The rounded forms of the soft conglomerate are easily distinguishable from the jagged and fantastic outlines of the hard zone. The highest peaks typical of each category are respectively Hazrat-Ishan (13,000 feet) and Kuch-Manor (10,500 feet). Both of these were constantly visible from our quarters in the Russian colony of Safet Daria. The scenery is wild and weird to the last degree. An intense solitude pervades the valleys, where Nature is so sparing that scarcely a living creature is to be seen. Serrated ridges and gaunt pinnacles stand out black against the blue sky.

In this district we spent several months. By the time we arrived the vegetation had quite dried up. As we climbed the slopes, the crackling skeletons of umbelliferous giants punished our intrusion with

---

names of Oshanin, Severtsoff, Regel, Fedshenko, Ivanoff, Pokotslo, Yonoff, and others. Many of the results obtained by these travellers are recorded in Mr. Rob. Michell's paper (*Proceedings*, 1884), and in Mr. Delmar Morgan's able *résumé* on the recent geography of Central Asia (*Supplementary Papers*, 1885).

The first who actually visited this district was the Russian botanist, Dr. Regel (1882). A translation of his letter from Kala-i-Khumb is to be found in the *Proceedings* of 1882. In the following year he visited Shugnan, accompanied by Kossiakoff (*Proceedings*, 1886). From his original report I gather that he journeyed through the valley of the Yakh-Su, and this is corroborated by the map showing his route (*Proceedings*, 1884). All the other travellers whose reports I have read have avoided this valley.

The best map is that of the Russian General Staff, which gives a fairly accurate idea of the topography of these parts, and on which the river is called Yakh-Su. All previous maps have Ak-Su. There is no other information beyond that conveyed by Regel's account and the various maps. The peculiar and remarkable features of this region seem to have escaped observation.

To those who consult the maps in the Society's publications a few hints may be useful. On the map of Pamir (*Proceedings*, 1884) Saripol is easily found; Khovaling is called Khalaling. On the map illustrating Kossiakoff's route (*Proceedings*, 1886) the name Shignan occurs just below that of Talvar (Talbar). The little river immediately to the south of Shignan is the Safet-Darya. Shugnan (as the latest Russian spellings has it) is a subdivision of the district of Talbar, and must not be confused with the province of Shugnan; it is not a single village, but the collective name for a number of settlements. The same map has Tavaling (instead of Khovaling) placed to the right of the spot where the Ak-Su begins to be represented by a dotted line.

* Dr. v. Krafft will give the results of his geological investigations in the forthcoming publication of the Vienna Academy of Sciences.

showers of dust. Only where there is a constant trickle of water green patches may be seen throughout the summer. In the higher regions, of course, the meadows remain green a long time. Trees are scarce, but in the more secluded valleys apologies for woods manage to exist, to the great delight of the lover of nature. The pine is represented by the thuya, which thrives on scanty soil, and is satisfied with a precarious foothold on the brow of precipices, safe from the ravages of man.

The Yakh-Su valley is the home of majestic walnut trees. With their gnarled stems and spreading foliage they are the pride of the

RUY DASHT, ON THE SAFET-DARYA.

hillside. Unfortunately, some years ago an Armenian vandal destroyed many thousands of them for the sake of their grained knots.

As to the animal world, I only observed two wild mammals—marmots and a species of mountain sheep. I once stalked and wounded one of the latter, but it got away among the inextricable maze of gullies and ledges. I believe it was *Ovis arkhal.* The habits of the marmots are instructive from the point of view of animal economy. The beginning of their hibernation is determined by two different factors, the dry season and the cold season. Around the Russian village, at a height of 6000 feet, their piping is continually heard in spring, but they do not show themselves any more at the entrances of their subterranean abodes after the middle of August. Two thousand feet higher their food is green much longer, and there they do not retire before the

beginning of September. At an altitude of about 10,000 feet only the cold will send them to sleep, because the water trickling from the patches of snow keeps little kitchen gardens going for them.

The same causes influence the migration of wild and domestic sheep. In September I was unable to discover any arkhal about Kuch-Manor, where they usually abounded. They would be found around Hazrat Ishan if it were not for the shepherds, who infest this mountain with their flocks, gradually going higher and higher until everything is eaten up. Then the large herds of fat tailed sheep are driven downwards from all directions, and caravans of thousands of them throng the narrow paths. Their winter quarters are the irrigated lowlands

THE RUSSIAN COLONY OF SAFET-DARYA.

of the Amu-Darya, where food is found all the year round. Thus the sheep are always on the move, and the natives only keep a small stock in their villages for immediate wants.

There is one glorious pasture, however, which is safe from the cattle of man. The mountain immediately to the west of Kuch-Manor has a flat top offering an undulating surface of about half a square mile, which is conspicuous from Safet-Darya, and which changes its colour from green to brown as the months succeed each other.

When Dr. v. Krafft and myself reached the top of Kuch-Manor after some unsuccessful attempts, we also passed over this secluded paradise, which the natives have never been able to enter. Towards

all sides steep rocks descend from it, and the marmots that stare at you till you might almost seize them, and the broad tracks traced out by the hoofs of mountain sheep, show that here the wild animals feel secure, amid an abundance reserved for their exclusive use.

They are to be envied when compared to the ragged and wretched human population of the valleys below, which raises an uncertain crop of corn on the mountain slopes, and is mainly dependent for its livelihood on the gold-washing industry.

The precious metal has been obtained from this region for centuries, as is shown by the old heaps of tailings at higher levels than those frequented by the present natives, who only work near the water. Legend associates these traces of old workings with Chingiz Khan, whose name is as proverbial in Central Asia as that of Queen Tamara in the Caucasus. The apparatus for treating the gravel is very simple. A series of strips of felt are laid on a sand incline, at the top of which is placed a grating of wood. Upon this grating a shovel full of gravel is thrown and water poured over it. The fine matetial is washed down and the gold caught by the felt. All gold in the shape of dust is lost, some of the rougher particles only being secured. By this process not more than about a ton of gravel is treated per day. Groups of about five men work together. Two dig out the material, one carries it to the water, and two attend to the washing. These men are all in the hands of sweaters, who advance them the necessaries of life at extortionate interest, and keep them continually in their clutches. Consequently they never are able to attain comparative prosperity, and do as little work as they can.

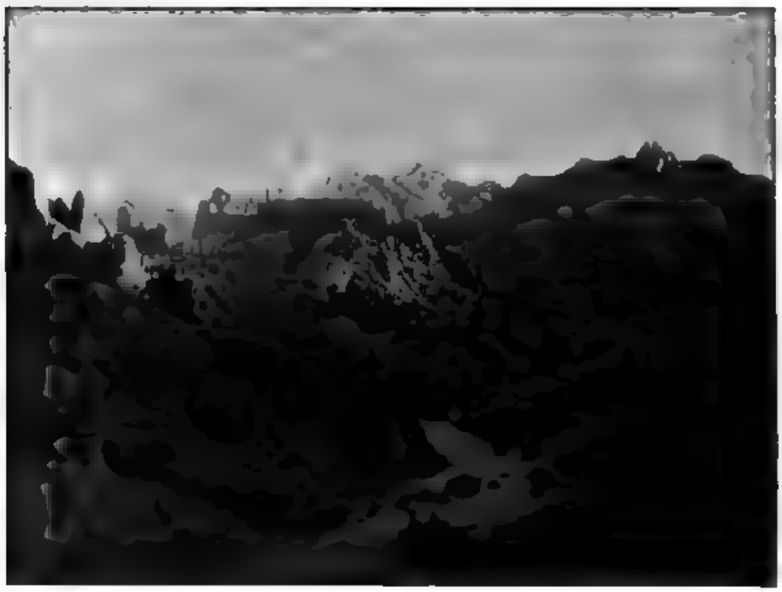
The yearly gold output of East Bokhara is variously estimated at from £20,000 to £30,000, a mere trifle considering the potentialities of the alluvial deposits. The quantities extracted by the natives in the course of centuries have hardly encroached upon the store, and they are as nothing compared to what Europeans might produce here in a few years. So far the proportion of gold in the conglomerate itself has not yet been established, the fluviatile deposits resulting from its disintegration offering greater advantages for mining purposes. The original birthplace of the gold is of course to be sought for in the surrounding crystalline ranges forming the banks against which the conglomerates were deposited. The gold occurs exclusively in tablet form, grains and nuggets being nowhere found. The largest piece we ever saw weighed about half an ounce; it is 92·7 per cent. fine. We have made extensive investigations into the distribution of the metal, and I here give some of the results. Two facts of general experience were at once apparent: the richness of the sands increased with the depth, and the gravel terraces on the banks were richer and contained coarser gold than the actual river-bed.

The alluvial deposits are clearly stratified, and the corresponding

layers can be more or less easily identified at distant spots. The top layer is about 6 feet thick, and contains on an average 8 grains of gold to a ton of gravel. Below this lie 19 feet of gravel with hardly any valuable contents. At this depth large blocks are encountered, forming a sort of stratum of their own, as if to protect what lies under them, namely, a blackish sand, which at the beginning yields 24 grains, and from which some 6 feet lower down we were able to extract nearly a quarter of an ounce to the ton.

The bed-rock lies at least 20 feet deeper—that is to say, at least 45 feet below the surface. A native claimed to have reached it once. The people burrow in the ground like moles, and produce what are known

Kuch-Manor. Plateau.



DANDUSHKA-BEND.

in America as coyote-diggings. These tunnels are about 4 feet high by 2 feet, and go down to a considerable depth; but there being no ventilating-shafts, the farthest point that can be attained depends on the possibility of being able to breathe. As the strata are concave, getting thinner as they rise up the mountain-side, they can be successively intersected at any angle. The native shafts are directed towards the mountain, and descend steeply until the rich layer is struck, which they follow until the primitive oil-lamps cease to burn. Thin, sickly looking boys carry out the earth on their backs. They are half naked, and the few rags that just manage to stick to them are drenched with the muddy water which oozes from their baskets.

The level of the underground water coincides with that of the rich gravel, and is got rid of by what is technically termed a tail-race. Its initial stage is some excavation near the surface, from which the water is drained by a trench. As the work progresses up-stream, the canal is continued almost horizontally, thus cutting deeper and deeper into the rising ground. The canal is protected with flat stones or boulders, and the tailings of the advancing works are used to cover it.

From a shaft that is sunk near such a canal a short passage is run to connect it, the miners being guided by the sound of the running water. In this way these subterranean drains grow section by section, some of them being over a mile in length. The native method of mining is extremely dangerous. Sometimes a tunnel will collapse without warning, and many lives be lost in this way.

The horizontal distribution of the gold is very even. We found the same proportions at different spots. Surprises in the shape of large nuggets or nests are out of the question, but so are serious disappointments, for what one finds in one place one is sure to find 5 miles away, if only the general conditions of the localities are similar.

If it were not for the money-lenders and official blood-suckers, the native population might attain a flourishing condition. It has, however, lost all ambition and all forethought for the future. Though food is easily and cheaply obtainable from the nearest market towns, the natives are too poor to lay in stores, but live precariously from hand to mouth. Famines are frequent, and then the population is reduced to bread made from the pith of the asafœtida, while caravans laden with grain may be passing along the Yakh-Su on their way to Darwaz.

During our stay at Safet-Darya we made frequent exploring excursions to the surrounding mountains and valleys. Several visits were paid to the top of Hazrat Ishan. A fine ridge 7 miles in length, descending gradually from the summit, affords a splendid line of ascent. We used to ride for a height of 11,000 feet, completing the rest on foot. I give the height of the mountain as 13,000 feet, this being about 300 feet below the mean of the numerous readings from my five aneroids. All other heights have been treated in the same way, thus avoiding all exaggeration. On the south-eastern side the mountain is steep, owing to the projecting ends of the uptilted strata.

The opposite slopes are covered by the only glacier of which the conglomerates can boast. It is one of the second order, reaching down to a level of about 11,000 feet. Two hundred feet from the upper rim a deep bergschrund cleaves it from one side to the other, and below this several small crevasses occur. The one terminal moraine which I had occasion to inspect, and which is a little to the right of the main ridge of the mountain, is a high mound of *débris*, forcing the glacier to split at this point. Similar examples on a larger scale are offered in the Alps by

the Macugnaga glacier and the glacier the Miage, which also have obstructed their own way.

The most noteworthy peculiarity of this moraine, however, lies in the fact that it consists of rounded smooth stones instead of angular fragments. For a glacier working on conglomerate, the production of such a moraine is of course quite logical, but it strikes one forcibly as one of those quaint possibilities which the fertile imagination of nature loves to invent. A sharp ridge which begins at the *randkluft* parts the

A GORGE.

glacier into two branches. The longer one joins the *névé* in the col between Hazrat Ishan and the peak to the north-west. The shorter branch leads to the moraine which I have described. The snow-line I consider to be at about 11,000 feet.

The name of the mountain is derived from a Mohammedan saint, who is said to have converted to Islam this part of the country.* A minor

* This saint is also known as Hazrat Ali, and as another local name for the same person, that of Sha-i-Mardan was quoted to me. The mountain, in spite of its comparative insignificance among the great and numerous mountain ranges crowding the

saint, viz. a mullah from one of the villages, is buried on the top; a heap of stones and the usual pole hung with rags indicate the spot. Native officials in their gorgeous raiment may now and then be seen wending their way to the summit, bent on a pilgrimage to the holy grave. Any one not acquainted with the real reason for such bodily exertion on the part of these languid gentlemen, must rub his eyes and ask himself if he were not dreaming—an Oriental dignitary as a mountaineer is too strange a sight.

Owing to the particular position of Hazrat Ishan, the view from the top is instructive and beautiful. The great Transcaspian plain sends out a wedge in the direction of the Pamir. This wedge, which on the whole corresponds to the eastern parts of Bokhara, leads right into the great mountain fastness culminating in the Himalayas. Now, Hazrat Ishan is situated at the point of this wedge. Not a single snow-mountain is to be seen towards the west, but eastwards there is nothing but an ocean of ice and snow sweeping round in a huge curve from north to south. Thus Hazrat Ishan lies exactly at the apex of that semicircle which forms the boundary-line between eternal snows and the hills below the snow-line. We caught many a glimpse of the Hissar range, the Alai, Peak Kaufmann, the Pamir, and the Hindu Kush. Kuch-Manor we also climbed, and spent many exciting and enjoyable hours in its dark gullies and on the faces of its sunlit cliffs.

During our outings we never felt the least anxiety with regard to the weather. When day after day we beheld a blue and cloudless sky, we at last took it as a matter of course, and were never deceived. For a mountain region the regularity of the climate during the summer is astounding, and my table of barometrical and thermometrical readings is eloquent on this point. From the beginning of July to the end of October we had not a single drop of rain. In November, however, the Italian landscape changed into a Scotch one, mists came rolling down from the slopes, and snow began to fall. Until March these valleys are buried in snow, and almost inaccessible. Then comes a period of continual rain, which lasts till May, when the sun begins to battle effectually against the clouds.

I shall now deal at some length with the physical geography of a topographical feature which attracted my attention, and to the investigation of which I devoted some considerable time. So far I have been unable to find any mention of a similar phenomenon in the literature on the subject.

For want of a more elegant name, I shall let it be known as the

---

maps, seems always to have attracted much attention. For this its sanctity is partly responsible; moreover, its height and comparative isolation makes it very conspicuous to any one approaching from the west. On the map of the Pamir (*Proc.*, 1884) it figures as Kazret-Imam, and on the one accompanying Mr. Morgan's paper as Hazret-Imam, whereas the most recent Russian variant is the one adopted by me.

"Dandushka Barriers." As the word suggests, they are a series of obstructions, and as such they cannot fail to impress their existence upon any one wandering along the valley of the Dandushka river. They may be a joy to the geographer, but a different opinion is entertained by the horses which have to carry the said geographer [redacted]

An idea of the locality may be formed by a glance at the map. Running from south to north in a fairly straight line there is a long and narrow valley. In its upper portion flows the river Dandushka, but its lower half is claimed by the Safet-Darya, which enters it from the east. Then, again, a river from the right, the Yakh-Su, asserts its supremacy

SAFET-DARYA VALLEY, WITH HAZRAT-ISHAN.

and carries the collected waters to the Kizil-Su, which takes them to the Amu-Darya, the hydrographical omega of these regions. Thus we observe that all the watercourses which come from the east successively give their name to the one that comes from the south. First of all we have the rivulet *ab*, of which I was not able to ascertain the native name; then the Dandushka (*cd* is very small), the Safet-Darya; and finally the Yakh-Su, which draws a line, as it were, and stops the continuation of the series.

For the sake of convenience, I shall apply the term Dandushka valley to the entire channel from the Kuch-Manor to the Yakh-Su. I am thereby enabled to express by one word a conception which

2 s 2

represents an organic whole. Its beginning is where *ab* turns to the north, viz. already above the real Dandushka river and the end where the valley loses its individuality by merging into a larger one. Of course there is not the slightest intention of changing the native nomenclature, which is based on the relative quantities of water, which therefore, as will be seen, also has an important indirect bearing on the matter.

The length of the Dandushka valley is about 10 miles, the height above the sea-level is about 5300 feet at the lower and 7000 feet at the upper end. The fall is three per cent., and very regular; water is discharged into the Yakh-Su at the rate of 50 cubic feet per second. The bottom of the valley is a flat expanse of gravel bordered by the mountain slopes.

Looking along the valley, we see parallel to it on our left a ridge with a mean height of 8500 feet. Towards the west this watershed sends out a well-developed system of mountains and valleys, whereas on our side it is an unbroken wall with steep and short buttresses. From this side not a drop of water flows into the Dandushka during the summer. On our right, the terminations of great spurs abut at right angles on the valley. They are the ridges of the mountain group which is dominated by Hazrat Ishan.

The whole of the Dandushka valley lies in these parts of the conglomerates where the strata are horizontal. To the south of the stream *ab* and along the Yakh-Su the strata are inclined. The extreme ends of our line, therefore, touch the boundary of the geologically undisturbed region of the conglomerates.

Placed at the point where Dandushka and Safet-Darya meet, the spectator will see stretching away from him towards the south an imposing avenue of towers, buttresses, and domes carved out of the solid rock. If the light be favourable, he can follow with his eyes for 5 miles, some of the harder bands which jut out cornice-like from the wall above him, and which he can still recognize as thin black strips in the far distance. Down-stream the material is softer, and has not given the same opportunities to the chisel of Nature.

On the map I have indicated by a dotted line the flat bottom of the valley, which is a gravel plain with a uniform fall of three per cent. At several places, indicated by Roman figures, this level is narrowed in so as to form a series of sections similar to a string of sausages. The cause of these contractions are the barriers. The first of these lies just above the Dandushka river proper; number III. is a double bar. If one examines one of these structures from one of the intermediate basins, it presents itself as a high dam stretching from bank to bank. Near the mountain a narrow cleft gives passage to the river. Inside this cañon on both sides are smooth walls of hard conglomerate, and the same material is discovered below the water after the superficial bed of gravel has been cleared away.

The average height of the barriers is 50 feet. No. 1 is about 27 feet high; all dimensions of the barriers increase as one proceeds downstream. The uppermost terrace of V. is 100 feet above the water. The lowest point is at the rim of the gorge, whereas one must not take the greatest elevation at any point more distant from the cañon than the middle line of the valley, for the connection of the barrier with the mountain is drawn out into long curves which do not admit of establishing a sharp line of demarcation.

As to the breadth of the dykes—or, what is the same, the length of the cañons—it likewise increases as one descends the valley, and the passage widens out in proportion. A man on horseback can just squeeze

HAZRAT-ISHAN.

himself through the cleft of No. I., which is 40 feet long; IV. and V. combined form a concrete canal half a mile long, 12 feet wide, and from 40 to 50 feet deep. With the single exception of bar 1, the cañon is always on the left side of the valley, and close to the bank. On entering and on leaving the dark defile, the river always has level ground on its right, steep slopes on the left.

The various geographical features which I have outlined so far may not seem to present anything extraordinary in themselves, but they become interesting when brought to bear upon each other with regard to the origin of the Dandushka barriers. How have we to account for the level sections? for the cañons, etc.? Were there lakes?

Was it ice-work? Have we to consider upheavals, subsidences, or volcanic forces? If the first impression is not subjected to scrutiny, the casual observer will, in nine cases out of ten, take it for granted that the barriers are solid rock throughout, their outward appearance being easily accounted for by a superficial covering due to disintegration. The aspect of the cañon sawn through the living rock leads, by an unconscious process of reasoning, to the apparently simple and satisfactory conclusion that there exists a homogeneous continuity to the other side of the valley. As long as this erroneous view prevails, further inquiry confronts one with a puzzle. The surroundings are entirely of hydrodynamic origin (I include possible glacier work). Everything in the locality excludes volcanic agencies or the least tectonic disturbances. The conundrum, therefore, would read thus: A rock-basin hollowed out by erosion, and provided with a narrow outlet contemporaneously or later by the same force.

Soon the suspicion comes that the bulk of a barrier is a younger formation than the substance of the walls of the cañon. A likely explanation is afforded by the hypothesis of a Dandushka glacier, which left behind at different epochs a succession of terminal moraines; but I think that there is a simpler solution.

I believe that the barriers are preserved strips of huge masses of *débris* which once overwhelmed the valley from one side, and that the gorges are cut through the projecting ends of ridges. A valley somewhat deeper than the present Dandushka valley, but otherwise almost exactly corresponding to it, received from the east a large supply of detritus, by which it became buried nearly throughout its entire length. The new level thus created we may assume to have been a little higher than the present barriers. This mass of *débris* sloped, of course, towards the west, and pressed the river against the opposite mountain-side. Excavating its bed, the stream cut through some of the bulging projections and promontories embedded in the softer material. The rocky channel acted as a natural river correction, and protected the earth accumulated against it from being washed away. Above and below these points, however, the process of clearing out followed the usual course, and in the intermediate basins the original profile of the valley is being approximately restored. A barrier and a cañon constitute a geographical symbiosis; they owe each other their origin and continued existence.

In Fig. 5 (see map) I have tried to show how one may imagine the consecutive vertical and horizontal displacement of the river. I shall now prove my assertions.

A direct evidence that the detritus has come from the right is the inclination of the slope. But as inherent probability no inference could be better than that drawn from the orographical formation of the neighbourhood. We have in the west the face of a long wall—in other

words, a small supply of the products of disintegration—and opposite to it the outlets of a group of mountains. This is also illustrated by the fact that the Dandushka receives no tributaries from the left. That the accumulations once filled the greater part of the valley is shown by bits of terraces preserved here and there in sheltered positions, *e.g.* between two ribs of rock, etc.

Against my own antithesis—the Dandushka glacier—I might propound the question why a cause acting in the direction of the valley should not have kept a better balance between the two banks, seeing that the gorges are almost entirely restricted to the left side.

A BARRIER.

The proof that the hard conglomerate does not reach far into the barrier could best be brought by an excavation, but since such an experiment is costly, I must rely upon circumstantial evidence. Solid conglomerate never crops out anywhere near the middle of a bar. Some of the barriers show a succession of beautiful level terraces, as I have intimated by the contour lines in Fig. 2.

At the cañon the barrier is always narrowest, broadening out towards the mountain and merging into its slopes with a long curved outline. This outline shows the range within which the earth is safe against being washed away; in other words, the "protected area" of a barrier. If, as in Fig. 4, only a short distance intervened between two gorges, the river had not sufficient room to reach the opposite side of the valley.

Therefore a curved wall of *débris* connects one barrier with the other. The protected areas overlap.

In Fig. 5 one sees how a little stream (*cd* on the map) has dug itself lengthwise through a barrier. Its high steep banks of hardened mud and gravel are innocent of rock, and only its entrance into the main cañon is effected through a cleft in the side wall. This is repeated by the Safet-Darya, which also, before its entrance into the "Iron Gate," shows nothing but gravel banks, 80 feet high, on either side. A barrier in profile is shown in Fig. 3. The mainstay of the dam, the block of solid conglomerate, is generally exposed to some extent. Its summit is often quite free, and then has caused a notch to appear, which shows that here the atmospheric influences have acted on the loose stuff at great advantage, owing to the good sliding surface offered by the rock.

The shape of this bare projection affords a clue to the outline of the hidden portion. In the case of narrow barriers, the ends of small ridges have been sawed through, but the long cañons have "sliced off" big pieces from the mountain-side. The same principle is observed when microscopical sections are obtained from specimens embedded in wax (Fig. 2).

All the foregoing conclusions are supported by a phenomenon, which can best be studied between bars 1 and 2. There the river runs through a low stone gutter 30 feet long, which has on the right side a thin wall only 3 or 4 feet high. The difference in level between this channel and the surrounding plain is so small as to escape the eye. Thus the river apparently follows some inexplicable whim, selecting a narrow rigid groove in preference to the wide expanse of ground at its disposal.

Two similar formations are below the sixth barrier. From the point of view of evolution, they are the beginning of cañons. Various reasons lead me to think that the original bottom of the valley has not yet been reached, and I have expressed this by the line *bc* in Fig. 1. As to the causes of the great accumulation of detritus, I think that possibly a glacier may have been responsible for it. The traces of glacial corrosion cannot be supposed to be preserved long in a crumbling material like conglomerate. Only where quickly covered up by some time-resisting deposit, they would have a chance of being handed over to posterity.

A reliable witness is, perhaps, the great boulder which I discovered at the junction of Safet-Darya and Dandushka. Its size is about 80 cubic feet, and it rests with one of its angles on the clean rock slab over which the water of the Safet-Darya runs into the other river. Its surface shows numerous short and irregularly grouped scars, and the assumption is not too risky that it has been brought there by the ground moraine of an ice-age glacier of Hazrat-Ishan.

After having continued our investigations to the middle of October, we had to think of the homeward journey. Before, however, finally leaving East Bokhara, my wife and myself made a trip to Muminabad, Kulab, and Sayat, pushing as far as the little Russian frontier-post of Parkhar, in the beautiful and idyllic plain of the Sayat-Darya. Here we have a pleasing combination of pasture, park, swamp, and impenetrable jungle. The reeds swarm with pheasants, and every pool of water is the abode of numerous waterfowl. The tracks of the tiger are frequently seen, but I waited four consecutive nights without getting a shot. Returning to Safet-Darya, we found a snowstorm raging in the Yakh-Su valley, and, arriving at the Russian colony, found the place buried in snow. These signs of approaching winter warned us not to delay our start. On November 4, therefore, we left, following our previous route as far as Ak-rabat. Here we struck northwards, and travelled by way of Shahr-i-ziabs and Kitab to Samarkand, thus bringing to a close a most interesting and instructive journey.*

After the reading of the paper, the following discussion took place:—

Mrs. Rickmers: I have often been asked how I bore the hardships of the journey just described by my husband, and perhaps this is a good opportunity for saying a few words on the subject.

In the first place, well-meaning friends did me unconsciously, perhaps involuntarily, a good service by drawing such harrowing pictures of the discomforts to be endured, that realization, as usual, fell far short of anticipation. My path from Batum to Bokhara was so strewn with their counsels and warnings that it was not their fault if, by the time I reached the Khanate, I had not a vivid premonition that we should die of thirst in the desert, or be massacred in some mountain fastness by the inhabitants. Even the secret hope I indulged that some mild form of adventure might be our fate was doomed to disappointment. Nothing more exciting than an occasional encounter with native dogs ever befel us.

As to the discomforts of the journey, they were really very trifling after all. Dress could fortunately be regarded with indifference, and this, together with the constancy of the climatic conditions, simplified matters considerably. Constant exercise in the open air is conducive to wholesome fatigue, and I have often rested better on the mud floor of a Bokhara hovel after a long day's march than amid all the refinements with which Western civilization woos the god of sleep.

Open-air travel suggests another consideration. The leisurely march on horseback enables the traveller to see and take in the details of the country through which he is passing. Western methods of travel, in proportion as they have gained in speed, have lost in interest. The traveller borne through space at the rate of 60 miles an hour, sees but half the landscape through which he travels, and, as often as not, passes through the fairest regions at night. When he wakes in the morning, after a somewhat disturbed night's rest, it is, at best, amid a good deal of discomfort that he performs his morning toilet. Not so in Bokhara; our quarters there were

---

* I have just received the 'Jahrb. K. K. Geol. Reichs-Anstalt' (Wien, 1898), B. 48, H. 3 and 4, where A. Bittner describes some of the fossils collected by Dr. von Krafft during his excursion to Daswas. There are several new species. Some strata near Ravnau are practically identical with the Werfener Schiefer of the Alps.

generally spacious enough to admit of dressing in comfort, while a morning bath was a luxury almost always attainable.

Exercise had another beneficial effect. By whetting our appetites, it made us indifferent to the monotony of our menu. If we could regard the culinary questions which vex and perplex our daily life in the West, with that equanimity with which we ate eggs for supper every night for two months in our mountain home on the Safet-Darya, we should go far towards realizing our dreams of Utopia. In conclusion, I believe any woman, possessed of good health and accustomed to exercise, could, if properly equipped, perform a similar journey and look back on it with pleasure. To such as think of so doing, my heartiest good wishes. May they go and prosper!

M. Lessar thanked the President for the invitation to address the meeting, and said that, not having been himself in Baljnan, he was unable to add anything on the subject, especially after it had been so ably exposed by Mr. and Mrs. Rickmers. In the narrative of their travels he was very glad to find a confirmation of what he knew as to the peace that now reigned in Bokhara, contrasting so strikingly with the state of things that existed there some thirty years ago. It was a great gratification to him to hear once more about the results of the efforts made by Russia for civilization in the country—a task which he was happy to say Russia accomplished in Asia conjointly with England.

Colonel Sir Thomas Holdich: I regret that I have but a slight acquaintance with these regions about which we have had so interesting a lecture. Although I am not personally acquainted with the country which Mr. Rickmers has actually visited, I have on two occasions approached it more or less. On the first occasion it was in the company of my distinguished colleague, M. Lessar; as I was with Sir Peter Lumsden's commission to define the boundary between Russia and Afghanistan. On that occasion we approached it from the west, and followed the Oxus up to within the regions of this map which you have in front of you. At Kilif we found that the river was in flood in the summer, bringing down the melted snows; it was fully half a mile wide, a splendid rapid-rolling stream across which it was exceedingly difficult to get. There is one very curious feature about this part of the Oxus—the only available ferry there which connects Kilif with the Afghan shore on the opposite side is worked by horses, which draw the boats across the river. I don't know any other part of the world where the same system exists. It was curious to see the enormous weight which could be piled on to these rude Oxus boats and hauled across by what appeared to be most inadequate means—two or three insignificant-looking little ponies. It was a revelation to me of the extraordinary power with which horses can swim. Beyond that, eastwards and northwards, we followed the course of the Oxus river until we came to the Kundur river; and in the course of our surveys, we investigated that most interesting region; but it hardly touched the country which Mr. Rickmers has described. The mountains on the north side of the Oxus were a considerable distance from the river. There was one I remember well, which served us for a landmark from afar, which, if I remember right, was called the Koh-i-Tan, somewhere west of Mr. Rickmer's recent journey, and which I should think would be well in view during the time he was working there. Beyond Kwaja Salar, which was the point we particularly went to investigate, we may have carried our surveys up to about 50 miles, and from that point the river was lost in the mazes of the hills Mr. Rickmers has described.

On the second occasion when I approached that country was on the Pamir Boundary Commission of 1895. On that occasion we saw the Oxus at its source at Lake Victoria. I was pleased to note that since my previous visit the Russian

surveys had made extraordinary progress; then much of the country seemed to be thoroughly well known. So far as we could tell in making a junction between our Indian and the Russian surveys, they had reduced the mapping of much of those regions to something like absolute certainty; but between that bend of the Oxus and the point beyond Kilif which we touched on the previous occasion, I am not aware that any one has really surveyed the Oxus with sufficient certainty to show an absolutely reliable map. Two or three explorers of the Indian Survey have been along that line. The surveyor who went with the Forsyth mission long ago traced the course of the Oxus from Kila Wamar to a junction at Kwaja Salar with our work which followed; but that man, I regret to say, met with a tragic end afterwards in Afghanistan. Subsequently another explorer followed the river down, and made an excellent traverse through that country, and from his work we know most about it—in fact, all we know at present; but it would interest me exceedingly to know whether from the northern side any surveys have been carried out to make us certain of the actual position of the valley. I need hardly say it is with very great interest I have listened to the lecture, which carries me back to regions which I have twice visited in such excellent company. It has not only enabled me to renew my acquaintance with my distinguished colleague, but has given me an opportunity of seeing what I really consider the very best series of illustrative photographs I have ever seen in this room.

Colonel Le Messurier: I have listened with very great pleasure to the account given by Mr. Rickmers and by Mrs. Rickmers of their exploration in Eastern Bokhara. I can most heartily endorse all that has been said of the civility and assistance rendered by the Russians to any travellers in Central Asia. The safety of the traveller is, without doubt, entirely owing to the Russian control. The English endeavour towards the civilization of Central Asia may be said to have ceased with the murders of Stewart and Connolly, in Bokhara, nearly sixty years ago, and with the death of Burnes at Kabul during the first Afghan war. Since that time Russia has continued steadily in performing the good work. Bokhara itself became a vassal state of Russia in 1868, on the fall of Samarkand; Khiva submitted to the same power in 1873; and later on the final overthrow of the Turcomans at Geok Tepe and Merv completed the abolition of slavery, and introduced law and order throughout the land. Of the mineral resources of the district more will be known hereafter, when the works will be more fully developed; but if tradition counts for anything, we may expect very large developments of such products as lead, silver, salt, and petroleum in great profusion from territories drained by the Oxus. As regards the "barriers," of which we have seen such excellent photographs, I understand that they exist amidst a vast region of conglomerates where the strata are horizontal. Similar areas occur in other parts of Asia, notably one in the valley of the Indus in Ladak as you approach it from the south, where the mountain plateaux and lower plains are composed entirely of conglomerate interspersed with bands of sedimentary rocks, which in this case are nearly vertical. In a less degree the photographs remind one of the formation to be observed in the Gomul and the mouth of the Bolan passes on the north-west frontier of India.

The President said: Before asking you to pass a vote of thanks to the author of the paper, I cannot help calling attention to the enormous benefit that Russia has conferred on these regions. When I was a boy I remember having the country described to me by a famous missionary, Dr. Wolfe. It was in a sermon at Malta, and it certainly kept me awake. I forget what the text was, but Dr. Wolfe first described the most unpleasant thing he had suffered himself, which was having a Guinea worm wound out of his heel on a reel. He then described the horrors of

the raids made by the Turcomans into Khorasan, and the condition of Bokhara at that time. Years afterwards my late friend, the famous Russian traveller Khanikoff, described to me the state of Bokhara in his time. Now it is described as a country perfectly safe to travel in by Mr. Rickmers and by Mrs. Rickmers, and we know that these horrible raids into Khorasan have entirely ceased. The whole of this is due to the countrymen of M. Lessar, who, I think we must agree, have conferred a great and lasting benefit on this region and on its people. Mr. Rickmers has described to us the extraordinary rapidity with which the natives of Bokhara sometimes cover hundreds of miles on horseback, which reminded me of the account of the old Spanish ambassador who paid a visit to the court of Timur at Samarkand. The great Timur was in such a hurry to see this strange visitor, that he gave orders that horses were to be got ready at every post, and no stoppage at all was to be made. The old Spanish knight was entirely made up of bone and sinew, and didn't much care; but, unfortunately, the fat Canon of Segovia, who accompanied him, got worse and worse at every stage. The people did not dare to let him rest. They must obey orders. They put pillows on the saddle for him to sit on, and got him nearly to the Iron Gates, but there the poor old gentleman died, while the ambassador arrived as fresh as paint at Samarkand.

You will all agree with me that Mr. Rickmers' communication is an excellent type of paper. Mr. Rickmers has not only, in a most interesting manner, described the country and the people and his travels, but he has also introduced most interesting points in physical geography in describing the mountains and valleys he has visited. I am sure you will all join with me in a unanimous vote of thanks for his paper and for the admirable way in which it has been illustrated.

NEW LIGHT ON SOME MEDIÆVAL MAPS.

By C. RAYMOND BEAZLEY, M.A.

I.

KONRAD MILLER'S great work, in six (or seven) parts, is now complete. The 'Mappæmundi'* occupy six thin quarto volumes; and to these we may add a seventh, of quite different size and appearance, but inseparably connected with the series that it precedes, and (in great measure) elucidates. This indispensable preface is itself composed of two parts: one of these is a coloured reproduction of the Peutinger Table; the other is a commentary on the same.† This study, published in 1888, was followed in 1895 by the first of the 'Mappæmundi,' an encyclopædic series of studies of the 'Oldest World-Maps' ('Die ältesten Weltkarten'). This first instalment dealt with the various designs of the "Beatus" group, to which we shall return presently; and here, perhaps, more than anywhere else, Prof. Miller has laid all geographical

* Mappæmundi, 'Die ältesten Weltkarten.' Herausgegeben und erläutert von Dr. Konrad Miller, Prof. am K. Realgymnasium in Stuttgart. Stuttgart: Jos. Roth'sche Verlagshandlung.

† (1) 'Weltkarte des Castorius, genannt die Peutinger'sche Tafel.' In den Farben des Originals herausgegeben und eingeleitet von Dr. K. . . . M. . . . etc. Ravensburg: Otto Maier. (2) Ibid., Einleitender Text, 128 pp.

students under obligation,* and shown to the fullest extent his brilliant powers, both of synthetic and critical work.† Here, also, he has most conspicuously added fresh material to our knowledge, by his rediscovery of ancient plans and map-sketches long supposed to be lost.‡ The 'Beatus' volume was followed in the same year, 1895, by an atlas of sixteen early mediæval maps,§ photographically reproduced; and by a textual examination of twenty-eight cartographical writings or designs, mostly from the eleventh, twelfth, and thirteenth centuries, which are grouped together under the title of the 'Lesser World-Maps' ('Die kleineren Weltkarten).‖ The fourth number of the 'Mappæmundi' series is given to the 'Hereford Map'; this appeared in 1896,'¶ like the fifth volume, devoted to the curiously parallel map of Ebstorf.** Both of these are illustrated by sumptuous reproductions (the Ebstorf in facsimile size and colour) forming large wall-pictures. Lastly, in the sixth and concluding part, Prof. Miller attempts to reconstruct a number of lost maps, among which that of the Anonymous Geographer of Ravenna occupies the first and leading place.††

It may, perhaps, be useful to make some attempt at an estimate and summary of what has been done recently for the study of mediæval geography in these works, and especially in the first, third, fifth, and sixth parts of Miller's 'Mappæmundi.'

It seems hardly too much to say that, in relation to the Beatus group, this scholar has brought us out of dusk into day. We may not be able to agree with all his conclusions; we may sometimes think certain details of his theories are too definite and positive in relation to the scantiness and vagueness of the material; but none the less his work is a revelation. He has made it clear that several works of the early mediæval cartography, such as the map of "St. Sever," that of "Turin," the "Spanish Arabic" map of the British Museum (1109), and others, which had in former times been usually treated as quite distinct, were intimately related, and indeed were simply reproductions

* We must not forget the admirable work of Cortambert and other French scholars, from which Miller has advanced to the present position. See, *e.g.*, *Bulletin Soc. Géog. Paris*, 1877, pp. 337–363.

† Mappæmundi, Heft 1, 'Die Weltkarte des Beatus, 776 n. Chr.' (with 4 map-reproductions, and a scheme of the Beatus group), 70 pp.

‡ Three of the copies, St. Sever, Turin, and London of 1109, have been known some time; the rest are pretty recent finds.

§ Mappæmundi, Heft 2, 'Atlas von 16 Lichtdrucktafeln.'

‖ Mappæmundi, Heft 3, 'Die kleineren Weltkarten,' with 78 illustrations of maps and several schemes showing cartographical relationship. 160 pp.

¶ Mappæmundi, Heft 4, 'Die Herefordkarte, 1276–1283.' (With 2 illustrations in text and a reproduction in full size.) 54 pp.

** Mappæmundi, Heft 5, 'Die Ebstorfkarte, Ende des 13 Jahrh.' (With reproduction in full size.) 80 pp.

†† Mappæmundi, Heft 6, 'Rekonstruierte Karten, des 7 bis 1 Jahrh. n. Chr.' (With 66 illustrations.) 154 pp.

(with small additions or omissions) of an original Spanish design, fairly attributable to a certain priest of the eighth century. Beatus, the priest in question, was the author of a 'Commentary on the Apocalypse,' which by external and internal evidence has been fixed to about the year 776; and in this commentary appeared a sketch of the world, which, there is no good reason to doubt, came also from the hand of Beatus. The author was famous in the general Church history of Spain as a leading opponent of the "Adoptionist" heresy of Felix of Urgel; and along with Etherius, Bishop of Osma, he firmly maintained the eternal Godhead of Christ in opposition to the view of Felix and his friend Elipandus, Archbishop of Toledo, viz. that the Son had been adopted and received into Divinity by the Father. For some time he seems to have led a monastic life under Abbot Fidelis, of St. John of Pravia, near Oviedo; and his death, in 798, took place at the Benedictine house of Vallecava, or Valcavado, in the Asturias. Queen Adosinda, the wife of King Silo of Oviedo (774–783), was a patron and firm friend of Beatus, who was her confessor; by one tradition he was also an instructor of Alcuin, though by another story he was a deaf-mute, and hardly capable of shriving penitents or taking much part in the work of tuition. At any rate, he shares with the celebrated scholar of Charlemagne's court in the abuse of Elipandus, who pleasantly describes Beatus as an obscure hill-man and cave-dweller, a babbling denizen of the woods, an instructor of brutish beasts, a forest donkey, and the like. His friends, on the other hand, though declaring that our author led a saintly life, are less explicit about his science and learning; but there is no real ground to suppose that the map is by another hand than that of the Apocalypse-commentator of 776, or that the commentator in question is other than Beatus.

The original world-sketch of 776 was probably drawn to illustrate the spread of the Christian faith over the earth, and in especial allusion to such texts as Matt. xiii. 1–9, 18–23, 24–32, and other comparisons of the world and the kingdom of heaven to a field sown with seed. This idea was further developed by a series of pictures of the twelve Apostles, each in the locality where tradition fixed his preaching and his diocese. A note of the Latin Commentary tells us quite plainly that these vignettes were an essential feature from the first; that they illustrated the preaching or sowing of the Word "in the field of this world;" and, by implication, that the apostolic portraits were placed here and there—in certain definite cities and regions—upon a world-map.* This map, therefore, aimed, first of all, at exhibiting the *Divisio Apostolorum*. And the *Divisio* was conceived as follows: To Peter was assigned Rome; to Andrew, Greece or Achaia; to Thomas, India; to

* "Et hii falcibus haec seminis grana per agrum hujus mundi metent. Quod subjecta formula picturarum demonstrat."

James, Spain; to John, Asia; to Matthew, Macedonia; to Philip, Gaul; to Bartholomew, Lycaonia; to Simon Zelotes, Egypt; to Matthias, Judæa; to James, the brother of the Lord, Jerusalem; while to Paul there was no such definite location given, as his mission was to all the world. His portrait, however, appeared on the map, along with that of St. Peter, at Rome, as a co-founder of the "Apostolic see." * These pictures have only survived in one of the ten existing copies of the Beatus map, that of "Osma," bearing date A.D. 1203; and of course the so-called portraits are all of one type, and that an intensely sacerdotal one.

The ten copies just referred to are plausibly classed by Prof. Miller in two main groups, and each of these he subdivides once more. The first main division is the family of Osma, the second that of Valcavado. To the former belong three copies, to the latter seven. The parting of these two chief stems certainly takes us far back into the tenth century, if not into the ninth, and where the first, third, fourth, and eighth copies agree † we may well suppose we have absolutely original matter. Each of the great stems appears to be immediately derived from one or more "intermediate" copies (as we may term them) of the tenth century, copies which have not come down to present-day knowledge, but may yet be recovered, perhaps in the recesses of a Spanish convent.

The three examples of the Osma type are maps of very different value. First, there is the "St. Sever," now at Paris,‡ a work executed at the above-mentioned convent in Aquitaine about 1030–1050; this is the most valuable, the most carefully executed, and the richest in content of all the copies. It is probably the nearest to the original type, and is therefore primary in any attempted reconstruction of that type. Next we have the "Paris" of about 1250,§ which cartographically is a frightful jumble of seas, countries, and natural features,‖ but has some valuable reminiscences of certain original material not so prominent elsewhere. These two copies together form, in Miller's view, the first subdivision of the Osma *stem;* the Paris of 1250 making a link between this and the next group, or subdivision, of which only a single specimen remains. This is the "Osma" *map* of 1203, which

* The Commentary, which is mainly based upon St. Isidore, of Seville, describes all this in writing; and the map (in the Osma copy of 1203) agrees pictorially with the indications of the Commentary.

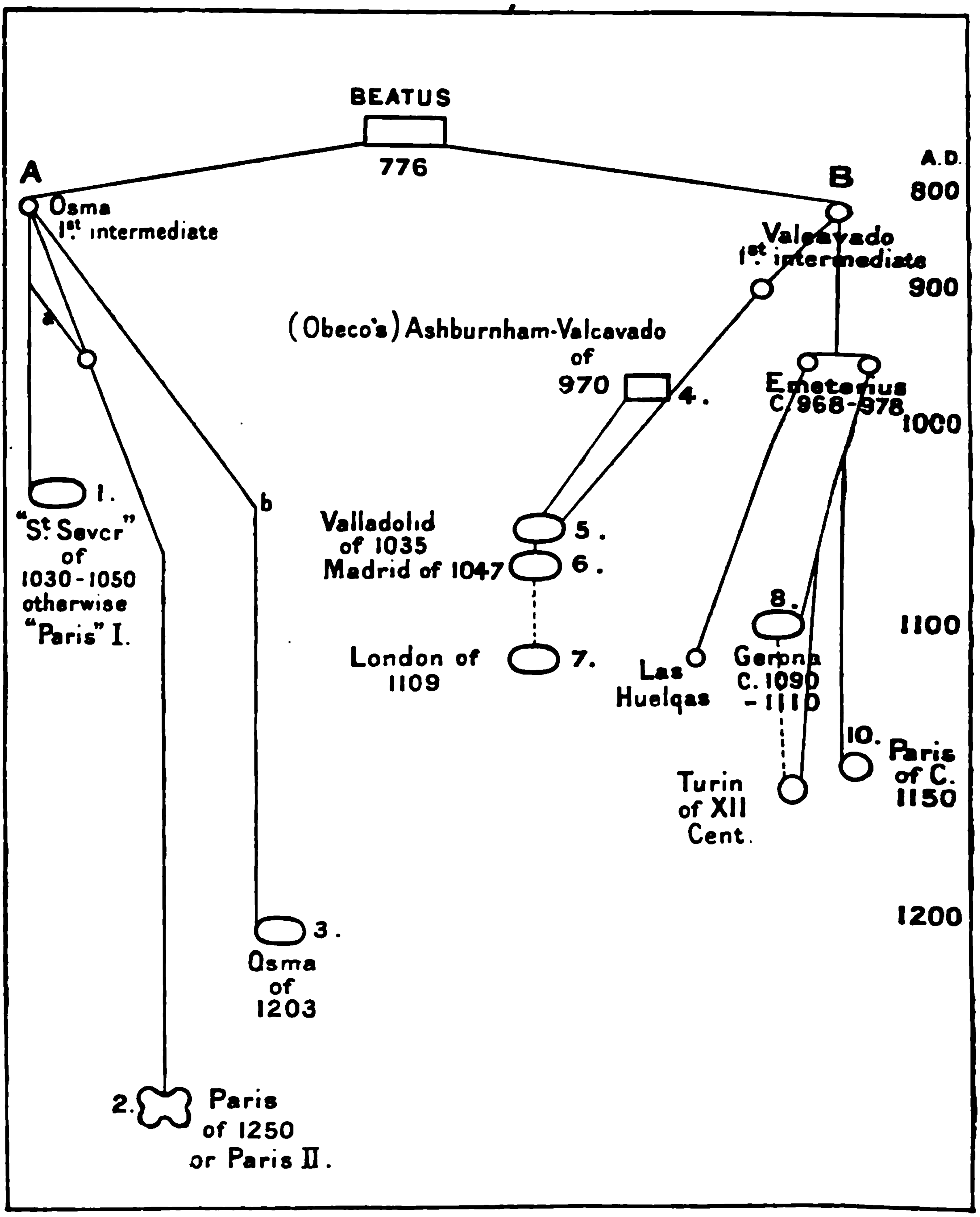
† "St. Sever," "Osma," "Valcavado-Ashburnham," and "Gerona."

‡ And hence labelled "Paris I." among Beatus maps. The manuscript was written at the order of Gregory de Muntaner, Abbot of St. Sever 1028–1072. On Fol. 6 the names "Stephanus Garcia Placidus" are conjected by Miller to refer to the artists or scribes of the same.

§ Also labelled "Paris II.," St. Sever being "Paris I.," and the B.N. copy of twelfth century, of "Emeterius" descent, "Paris III."

‖ E.g. *Palestine* in the interior of *Africa*, *Southern Italy* adjoining *Jerusalem*, which town is made quite separate from *Palestine*.

has much in common with St. Sever, especially in its general form. After the Aquitanian copy, it is certainly our chief example of Beatus cartography. In some points it is even superior, as more directly representing the original. Thus, in its pictures of the twelve Apostles



PEDIGREE OF THE BEATUS MAPS.

it is unique, and explains to us the very *fons et origo* of the Beatus scheme. Also, in its representation of the Eastern Mediterranean, of Taprobane (= Ceylon *plus* Sumatra, in confused mediæval idea), and of other parts, it shows to more advantage than any of its rivals. Like the

Paris of 1250, the Osma map represents the Skiapods or Shadow-footed Race of the Southern Continent, and depicts the site of Paradise simply by the springs of the Four Sacred Rivers. Its delineations of the two lighthouse towers at Alexandria and Brigantia are very remarkable, and certainly represent features of the original of 776.

The second family of copies Miller calls that of Valcavado. It contains seven examples, one of them the earliest yet found; but none of these seven approach in value to the maps of St. Sever or of Osma. They may, like the Osma clan, be subdivided into two groups: one contains the "Valcavado-Ashburnham" of 970, the "Madrid" of 1047, and the "Spanish-Arabic" of the British Museum in a manuscript of the Apocalypse Commentary written in 1109; the other includes the "Gerona" of about 1100, the "Turin" of the twelfth century, and the "Paris" of about 1150. Here also, as in the Osma group, we must allow for several lost copies, and especially for two of the tenth century, which are the immediate predecessors of the last three examples, and are both associated with one Emeterius of Tabara. Among the other examples here noticed, the Madrid map and the copy of 1109 seem to be directly inspired by the work of 970; they are all of very slight comparative value, and are further removed from the original type than any other copies. Thus the Valcavado of 970, traditionally the work of a copyist named Obeco, omits nearly all the rivers of the primitive design (as given by St. Sever, Osma, etc.), as well as the pictures or house-plans representing cities and towns, and turns the oval form * adopted by Beatus into an absolutely right-angled one. Among the examples of the last subdivision, those examples, namely, which come through the medium of the lost Emeterius transcripts, the Turin map is the most famous and interesting. It is not so old or so important as once supposed, for it appears to be no earlier than the beginning of the twelfth century; and it would seem to be in great measure a derivative from the map of Gerona (1090–1110?). But in any case it has remarkable peculiarities, which have naturally made it a favourite subject for reproduction. Perhaps it is the best known example of strictly dark-age cartography. For though the celebrated wind-blowers, so prominent here, are also to be found in a ruder form on the Paris of 1250, their execution on the Turin map is far more vigorous and developed, and supplies us with the best artistic detail of any feature in Beatus Geography.

There is no Graduation on any of our ten Beatus examples, though certain lines from the writing and ruling on the other side of the page have sometimes been mistaken for horizontal and vertical indications. In all these designs, except one, the east is at the top; the Paris of

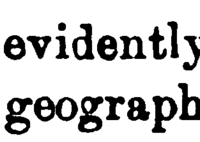
* This is practically certain. All the Beatus maps, except three, may be called ovals: "Ashburnham-Valcavado" is square; "Turin" and "Paris III." are circular. All of the more valuable Osma stem are ovals.

1250, which substitutes the south, probably through Arabic influence, makes this substitution with such hopeless inconsistency, in regard to other parts of the map, that it is clear the copyist is here departing from his original. Paradise is placed in the extreme east, accompanied with pictures either of Adam and Eve or of the Four Sacred Rivers. On the Ground-Work of 776 both these probably appeared together.* Following St. Isidore of Seville, Beatus seems to have placed the Garden of Innocence, not on an island beyond the continent, but on the mainland, encircled by unscalable mountains.

The division of the continents is in general the same as that of the so-called T-O maps [⊖], Asia occupying the upper half, while in the lower part Europe has the left-hand quarter, Africa the right-hand. The western border of Asia is formed by a series of rivers and narrow seas, from the Tanais, or Don, to the Nile.

Beyond Africa, separated by a strip of ocean, nine of the Beatus maps † show us the southern, Australian, or antipodean continent of an ancient theory, as endorsed by St. Isidore. According to this view, Africa did not reach to the equator, which was covered by an ocean zone, impassable from heat, beyond which again was a land of non-human monsters. Of the Antipodes, in the strict Greek sense, implying the Earth's rotundity, Beatus gives no hint; and the map of St. Sever evidently confuses Taprobane with the antipodean land of some classical geographers.

In the Beatus designs the ocean is usually ornamented with pictures of row-boats and fishes; and on one copy the fish in question appear to follow regular courses, as if to indicate the periodical wanderings of shoals of tunnies and herrings, or the direction of ocean currents. As to other features of special interest, we may perhaps notice that the Black sea and Caspian are only to be found in the three Osma stem copies. Also that the Red sea is understood by almost all the copyists in the sense of the whole southern ocean, including that on the south side of Africa, which, in Beatus, of course, is the *long* side of the continent



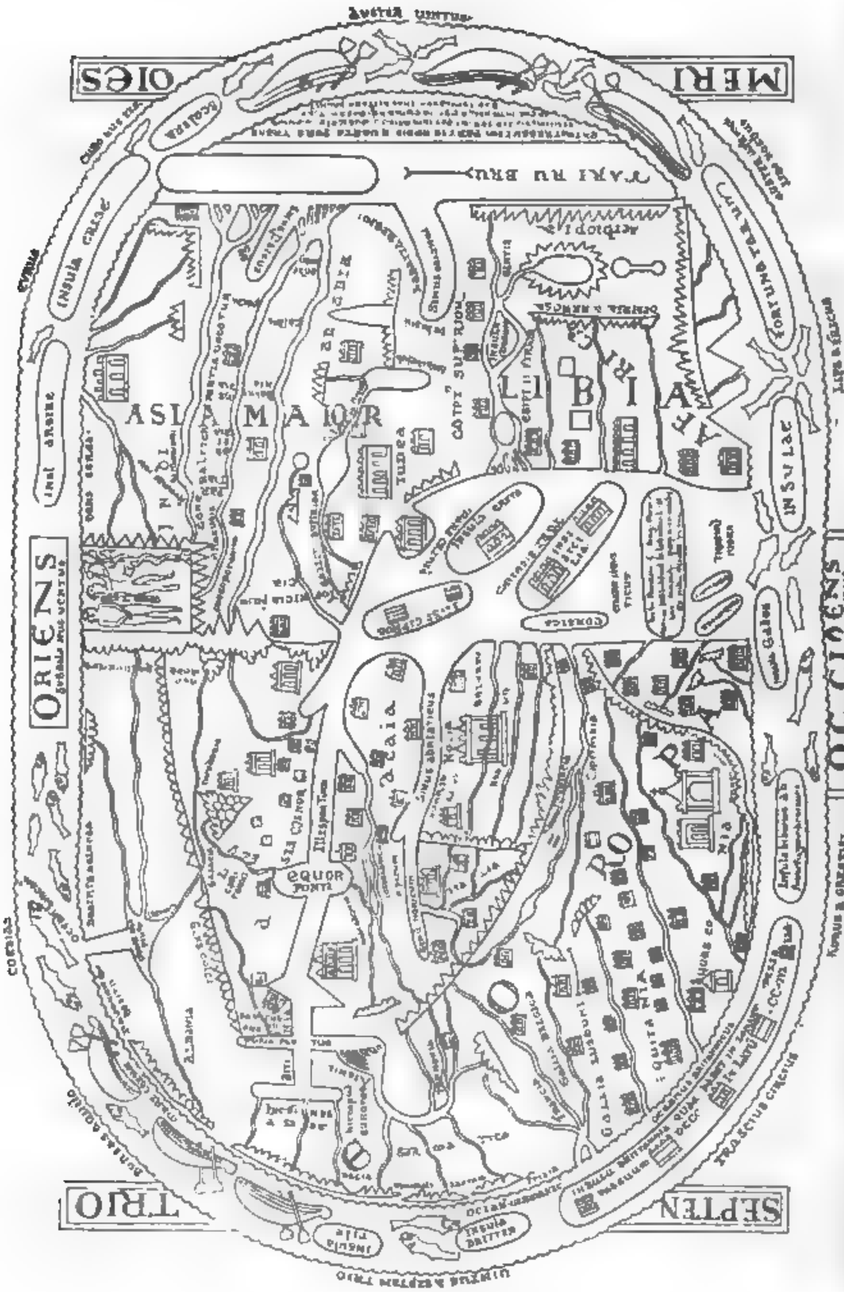
The Persian and Arabian gulfs are treated as mere inlets of the great Red sea; only the latest example, the Paris of 1250, shows a tendency ‡ towards the modern restriction in this point. Again, only our two best specimens, St. Sever and Osma, give us any large number of mountains or rivers. But from these copies, taken along with

* As on the Hereford and Ebstorf maps of the thirteenth century.

† The only exception is the latest of our copies, the Paris of 1250 ("Paris II."), and this gives us the Skiapod of the southern continent in a corner. This, of course, points to the copyist having had an original which gave the southern continent as fully as for instance, on the Osma example of 1203.

‡ Colouring only the Persian and Arabian gulfs red.

such scraps of evidence as the other transcripts afford us, we may conclude that the original must have contained the Rhine, the Rhone, the



THE ST. SEVER MAP.

Danube, the Euphrates, the Tigris, the Jordan, the Nile, and some Caspian affluents. On the other hand, the absence of Spanish rivers is remarkable. The chief towns of the οἰκουμένη were probably marked on the original by vignettes or pictures (reminiscent of the primitive Peutinger Table?) which survive on the Osma of 1203 and the Paris of 1250 ("Paris II."), and are developed with considerable sumptuousness and artistic beauty in the Paris of 1150 ("Paris III."). Among these, reproductions almost certainly of features of the 776 original, the most noteworthy are Rome, Antioch, Jerusalem, and Constantinople, with the lighthouses or beacons of Alexandria and Brigantia.

There is not much fabulous matter in the Beatus maps; and the two most prominent details under this head, the Phœnix of Arabia and the Skiapods or Shadow-Footed race of the Southern Continent, probably belong to the original. Jerusalem is never made the centre of the Earth, though the late Paris of 1250 shows a tendency in this direction. The "Sallust" map-sketches of the twelfth century are the earliest to show this feature with perfect clearness, though it is expressed in writing by the pilgrim Arculf, about A.D. 690, and even by earlier theologians.

The great winds of heaven were probably described rather than depicted in the original of 776 in much the same way as on St. Sever; the wind-blowers or Æoli of the Turin copy and of the Paris of 1250 are almost certainly later additions.

Beatus himself no doubt viewed his map primarily as an illustration of the Old and New Testament and of the spread of the Catholic faith. Besides the Scriptures (from which, however, he does not borrow much, beyond the Apostolical names), he seems to have used two main authorities. One was probably a Roman province-map, perhaps of a character resembling the Peutinger Table; the other was St. Isidore of Seville. St. Jerome, Ptolemy, Orosius, and Julius Honorius appear in the Beatus material only in an indirect and doubtful form. From the great Spanish theologian come almost verbatim the main body of the longer legends or inscriptions, most fully given in St. Sever. We must not forget that Isidore himself derived the matter, and even much of the form, of these little geographical dissertations from the cosmographies of the later Roman period. On the other hand, no earlier source of the apostolic picture-scheme is known; it may be, as far as embodiment on a map is concerned, wholly or partly original. But of course the apostolic locations, or dioceses, are found in very early Christian tradition, and most of them are probably true in fact.

Prof. Miller demonstrates with great skill and convincing force that the geography of Beatus, properly speaking, was derived from a typical province-map of the later Roman empire, on which each province was marked by representations of its two chief towns. The Caspian sea, the Alexandria Pharos, the Nile inscription, and the "Desert where the children of Israel wandered forty years," are closely parallel in the

Peutinger Table as we possess it (clouded by some thirteenth-century mediævalisms) and in St. Sever. The close relationship of the Beatus cartography to such an old imperial work as survives in the famous Table is the key to all satisfactory study of this interesting family of dark-age maps. It is a relationship that may be worked out in much detail; but here we will only notice such connection as will be found in a general comparison of the names of peoples, cities, hills, and rivers, and in the Indian, Syrian, and African legends; adding that in Gaul, not only are the same provinces named and the same divisions made, but the striking *omissions* of the table occur also in St. Sever.* Of the 133 names of towns in the Beatus maps, over 90 agree with "Peutinger," and among the 90 are found all (except two) of the important places marked by pictures.† The *arrangement* of the town-names in various provinces, and especially in Greece or Achaia, shows also a very close agreement. The "Francia" of Beatus, in its *trans*-Rhenane position, and the legends on Mount Sinai, and the desert of the wandering, were all probably on that old imperial map which Beatus used, and which lies at the root of the Peutinger Table; in certain instances where the Spanish draughtsman gives names to places which are pictured, but not titled, in Peutinger the same relationship is still more pointedly suggested.

On the other hand, Beatus has nothing similar to the Itinerary-content of the Table, and does not give us a single one of the thousands of stations and distances which occur in the great road-map. Nor, of course, can the table's many references ‡ to pagan temples and worship be paralleled in the world-picture of the Spanish priest of Vallecava. But, in spite of all differences, we probably possess in the Beatus maps a dark-age reflection, on a smaller scale, of one or more cartographical works of the latter days of the old empire, free from all additions of the crusading period, and of inestimable value as a link between the ancient and the mediæval world. While, lastly, in the Hereford and Ebstorf maps, and in several other plans of the central Middle Age, we have many indications of Beatus influence. We can show perhaps more at length in another paper that the links between classical and post-classical map-science, between the "Orbes Picti" of the Augustan age and certain designs even of the thirteenth century, are remarkably numerous and strong; and that mediæval cartography, even before the Portolani, was not altogether without system and knowledge, as apparent in examples other than those of the Beatus group.

* Usually little houses. The great vignettes at Rome, Constantinople, and Antioch were apparently recast, and much altered, by Beatus in his humbler, Christianized sketches from these splendid Pagan pictures.

† On the other hand, in the treatment of Gallic *towns* there are great differences, Peutinger representing the ancient name-forms, and Beatus (St. Sever especially) modern canton- or tribal-equivalents.

‡ Nearly 600, according to the most careful estimate.

REGIONS OF THE BENUE.*

By LICH H. MOSELEY.

In endeavouring to give a general description of portions of the Benue regions of Nigeria visited during a sojourn of seven years in those parts, the simplest way is to sketch in turn journeys made from time to time. Owing to the different kinds of country, and the many different tribes seen, it would be confusing to treat the subject as a whole.

First I deal with the country from Yola to Garua, including the valley of the Benue for 50 miles inland on both banks. The whole of this country, roughly 100 miles east of Yola, is under the rule of the Emir of Adamawa, the most powerful prince of the eastern half of the Sokoto empire. The original natives were the pagan tribes who now live amongst the hills skirting the Benue valley. The chief amongst them are the Batawas. These tribes were driven from their lands by the Fulanis about the time of the Fulah conquest of the Hausa States. Now the population consists of Fulanis and Hausa settlers, with a pagan settlement here and there that has been allowed to remain.

The country is flat and open, and splendidly fertile, little more than the actual planting being required to bring forth the most luxuriant crops of cereals. Guinea-corn, maize, rice, sweet potatoes, millett, and ground-nuts, together with a very fine corn known as "mazzagua,"† are cultivated to a very great extent, and form the chief articles of food.

Indigo is also cultivated greatly, and thrives well, being used by the natives to dye their cloths, which are made from the cotton plant, also freely grown. The method of manufacturing the indigo now practised by the natives is very primitive, but there is a great future for this industry. Gum-arabic trees are found everywhere, and there are also a fair quantity of gutta-percha and kino trees.

In the town of Yola is a large native market, a stroll through which would show cloth, silks, salt, tinware, etc., of European manufacture, exposed for sale side by side with cloths and gowns from Kano and Nupe, beads, calabashes, looking-glasses, knives, etc., even to scents brought all the way from Tripoli. The Hausa trader predominates here, as this market forms a terminus of the great ivory caravan roads from the hunting-grounds and markets of Tibati and Ngumderi.

About halfway between Yola and Garua the river Faro joins the Benue, coming from the south and rising in the Ngumderi hills. The pagan village of Taefe marks the confluence.

---

* Map, p. 696. It should be pointed out that the district embraced in the map is in the territories of the Royal Niger Company.

† "Mazzagua" is what is known as a dry-season corn, being planted just after the last rains in November, and cut about June. During the period of growth this plant receives no water, and there is no rain, yet it grows to a height of 9 to 10 feet. The head is about 8 to 9 inches in length, and the grain the size of a pea. The flour is exceptionally good and white, and makes delightful bread.

An important item that should not be overlooked is that cattle thrive splendidly in this country. Large herds are to be met all over the plains, and one Fula tribe are known as the cattle Fulanis, on account of tending and rearing cattle being their sole occupation. Butter is made in large quantities. Horses also thrive well, and several good breeds are to be found, especially those coming from around Lake Chad.

The present difficulties to the development of this splendid country are, viz.—

(1) The difficulties of transport to the coast. For seven to eight months of the year the Benue is practically useless for this purpose, only small canoes being able to pass up and down. This is one of the many rich countries lying *perdu* for the want of a trans-African railway.

(2) The Fulani race are not workers, and the pagan tribes who are have no opportunities of making headway, owing to their persecution and oppression by the Fulanis, who consider them as their slaves, catching numbers to send to Sokoto in payment of their annual tribute.

The seasons in these parts consist of the rainy season, from June till the end of October, the remaining months forming the dries, with perhaps a single rainstorm about January. The climate is fairly healthy, though Europeans suffer from anæmia, caused by the heat during the months of December and January, when the Harmatan winds are blowing from the northern deserts. During this period I have known the thermometer to register at 5 a.m. 60° Fahr., and 120° at 1 midday.

The next country visited was the large Fulani state of Muri. The country here resembles the Yola (or Adamawa) territory, though in a much smaller degree. Full of the same natural products and possibilities, it has not the Hausa population of Yola, and will never be properly developed under Fulani rule.

The Benue, flowing through the centre, divides this state into two parts. The only other streams of any size are the two wet-season rivers Saurata and Mainarawa. These join the Benue from the south, both rising in the Mūmi hills, which run parallel to the Benue about 30 to 40 miles from the south bank. These hills are inhabited by a pagan tribe of the same name. The long stretch of country between the states of Yola and Muri is inhabited by a pagan tribe, the Bassamas, after whom the country is called. They are independent and very wild, possessing a very fertile country, rich in the same products as Adamawa, whilst the hills in the interior contain iron, and should prove to be rich in other minerals.

Following the Benue west, we come to one of its main arteries, the Taraba river, which, rising in the hills around Gashaka, flows into the Benue from the south-east, and waters 100 miles of country. The Taraba is about 200 yards across at its widest part, and in the wet season has a

very strong current, only navigable by powerful light-draught launches, whilst in the dries only canoes can be used.

About 40 miles further west of the junction of the Taraba the Benue is joined by the Donga river, at Zhibu. Ten miles above Zhibu the Donga is joined by the Bantagi river coming from the east, whilst the Donga flows north-west from the mountainous Tugum country, about 150 miles south-west of Zhibu. The Donga river practically marks the extent of the Fulani power, and also of the high, flat, open country right from its bank east to Garua. South and south-west of this river lie the mountainous pagan lands about which, until very recently, hardly anything was known.

During 1896 I made a journey from Ibi to Takum and Kentu, a distance of about 100 miles. Again, in 1898 and 1899 I spent over a year travelling in the practically unknown regions 150 to 200 miles south and south-west of Ibi, and will endeavour to summarize my description of these journeys, as to treat with every place visited would take up too much space.

From Ibi to Takum, a distance of about 75 miles, the country is well known, and little need be said of it here except that it is populated by pagan Jukums, Diis, and Tikaris, with a large proportion of Hausa settlers and traders. The land is fertile and fairly well farmed, rice doing well along the banks of the Donga and in the Munchi country. The roads are good and safe.

From Takum Kentu lies south-east about 38 miles, and it is there that the really big ranges of hills are first met; they run south and south-west, and will be found, I think, to extend to the Cameroon range. The furthest point visited south was Great Bafum, about 15 miles south of Kentu. From Great Bafum I proceeded north-west through Bafum Me, Bafum Katse, Mache, crossed the Kuni hills, and descended into the valley of the river Katsena, which I had previously crossed whilst in the Great Bafum country. This is the first time that the Katsena has been traced to this distance. It rises in the Nso hills, and flows generally north-west into the Benue, roughly 200 miles from its source. All the country mentioned above consists, as far as the eye could see, of huge ranges of hills, the highest crossed being the Kuni range, about 4000 feet. The roads traversed were extremely difficult. The valleys are filled with very thick tropical forests, containing many kinds of rubber, palms, teak, etc., and in some places mahogany.

At Kentu the population consists of a few pagan villages, built on the tops of the hills for protection from the Fulani raiders. The people are Tugums, and their tribe is scattered for about 50 miles south-west and around Kentu. Between Kentu and Dumba, which lies 10 miles due south of the former, no villages are met, the country being a wild, hilly waste. The Dumbas, as are also the Tugums, are a naked pagan race, simply farming enough corn, yams, bananas, and sweet potatoes,

etc., for their own consumption. Latterly, however, the natives around Kentu have made rapid strides towards civilization, owing to the trade routes between there and Ibi having been opened up and safety assured to Hausa traders desirous of obtaining the rubber, etc., in the forests around. During a stay of some months there, I induced a number of Hausas to form a settlement at the foot of the Kentu hills.

From Dumba, 20 miles south, the Bafum country begins. It is inhabited by the largest and most powerful pagan tribe known in these parts. The country is divided into three distinct portions, Great Bafum being the most westerly and largest, to the east of which is Bafum Me, meaning the palm-oil Bafum, on account of the oil made there. North-west of the last-named is Bafum Katse, meaning the farming Bafum, that and the manufacture of farming implements being the sole occupation of the people. Hoes, knives, matchets, etc., are made out of iron found in the hills around. On leaving this place, the chief presented me with specimens of their work in the form of a knife to cut up my food with, a matchet to cut grass for the horses, and an axe to supply wood for camp fires. These, he said, would always serve to remind me of Bafum Katse.

The whole of the Bafum tribe are wild pagans, the majority going naked. At Bafum Katse my camp was surrounded by thousands of wondering naked savages, who never before had seen a white man or a horse. At Great Bafum the kola nut is grown, and buyers come from Takum, the kola market for all the lower Benue states, to purchase. Bananas and plantains are the staple articles of food throughout Bafum, though maize and guinea-corn are grown in fair quantities.

In 1889, Zintgraff, the famous German explorer, crossed the Great Bafum country from north to south, avoiding the large settlements, but although seen by only a few natives, he is still well remembered, on account of an attempt made by the Com tribe, whose lands bound Bafum on the south, to capture his caravan.

The chief of Great Bafum, who resides with his household at a settlement high up in the centre of the Bafum hills, is a well-preserved man of about fifty years of age, and is the recognized chief of the whole of Bafum. At his request I visited him, remaining as his guest for three days, during which time myself and followers were treated royally. This was on account of fear being instilled into him by a firework display which I gave on the night of our arrival. Had it not been for this display, I doubt whether we should ever have got through his country. It would have been impossible to have found passable roads for carriers and horses without the guides he gave us, besides having to overcome the opposition we should have met without his passport. Before leaving, on an excuse to clinch our friendship, I managed to obtain a photograph of this chief.

It must be some years, however, before this country can be opened

up, owing to the immense natural difficulties presented. The river Katsena, which waters the whole country, is not navigable past the first small rapids, which occur 100 miles below here, the river also being full of rocks. William Wallace, agent-general of the Royal Niger Company, was the first European to explore this river, though only reaching as far as the rapids mentioned. The country is essentially a mineral one, the hills consisting mostly of ironstone, quartz, and granite, and would, I firmly believe, reward prospectors who cared to take the risks of a visit. Apart from minerals, ivory is by no means scarce, elephants being fairly numerous. To my knowledge, many small chiefs have quantities of ivory stored away.

The natives of Bafum Me and Bafum Katse, although the same tribe as Great Bafum, are much wilder, the former being cannibals and plunderers. Those of Bafum Katse are, however, very peaceful, but the most primitive people I have ever met. They go entirely naked, save for a beautifully woven grass cap. Never by any chance could one of their number be induced to cross the boundary of their lands, and only a few privileged strangers dare enter. One of the most striking features of this peculiar people is that they build the finest houses I have seen built by Africans not in touch with Europeans—large two and three storey houses, beautifully made of a hard red clay over a foundation of fan-palm stalks, having windows and doors with well-fitting frames, roofs of a pyramid shape, with rafters of the same palm, perfectly thatched with special grass. Furniture of a useful and comfortable kind, consisting of well-made bamboo beds, wooden chairs, and couches, are found inside. The formation of the chief town is quite European in its style—straight wide roads, with squares at intervals, the houses being built with even frontage, and the whole kept beautifully clean.

Mache, which borders Great Bafum on the north-west, Bafum Me on the north, and Bafum Katse on the north-east, is a similar kind of country. The people, however, are more civilized, on account of a few Hausa traders occasionally visiting here from Takum. The river Katsena flows through the centre, and from the high hills I was enabled to take valuable observations of its course from Bafum, hitherto unknown. In the valleys here I found Ireh rubber trees and rubber vines in good quantities.

The hilly country continues north-west, descending the Kuni hills about 4000 feet, in some places almost sheer, into the valley of the Katsena at Ngardi. Following down the river for about 20 miles, you pass through a country inhabited by the Dii's tribe, belonging to Mudi, to the west and south-west of which lies the Munchi country.

Munchiland is another quite distinct and exclusive country, running from the south bank of the Benué about 80 miles below Ibi, south to Dama. The country is cut up into numerous tribes of Munchis, although

all are of the same origin. They are very industrious farmers, growing yams, guinea-corn, maize, rice, millet, sweet potatoes, beans, henniseed, etc., in very large quantities, sometimes to such an extent that grain is allowed to rot for want of storage room. On account, however, of being very warlike, and possessing a most deadly poison, which they use on their arrows, they are a very formidable enemy, and unless suitably protected no stranger is safe amongst them. All of the villages, which are built in a circular form, are fortified with strong mud walls or pallisades, and ditches, as nearly every one is at war with its neighbour.

The land is generally flat, with fairly large hills at intervals, extremely fertile, and well cultivated. The Katsena, running through from south-east to north-west, waters the country, and also forms a means of transport during the wet season. Around Orufu, which lies about half a day's journey from the bank of the Benue, are found silver, iron, and antimony in fairly good quantities. The central and southern parts of this country are mostly given over to farming. The Munchi has already been taught to respect the white man to a certain extent, and when once his fighting proclivities have been subdued, his country should prove one of the most valuable portions of the Nigeria. I might add that he is also a big hunter, and ivory and skins form part of his wealth.

At the south-west corner of the Munchiland lies Dama, which consists of the states of Dama Chicua, Dama Cura, and Dama Lara. This again is inhabited by a totally different tribe, very numerous and fairly peaceful trading pagans. The land is very fertile and well watered. Yams form the chief article of food, and miles and miles of these farms are to be met with. Bananas, sweet potatoes, guinea-corn, maize, and millet are also grown. The farms suffer badly from the raids of elephants, of which the country is full. Quantities of ivory are to be found here. Many articles of trade seen with the natives had come from the Cross river, amongst other things noticed were cloth, matchets, flint guns, and powder. The nearest trading-station I gathered to be about six days' journey west of Dama Lara, the most westerly point visited, but could not ascertain the name.

To the east of Dama, and surrounded by hills, is the Gayem country, inhabited by a race of cannibals. They are very numerous, and live a totally secluded life. The whole of their lands consist of yam farms. Meat is very scarce, which was the reason given by the chief for their cannibalism. No member of another tribe dare visit these people, except, however, elephant-hunters, who are tolerated because of the meat they kill.

Here I might add that from Kentu, including Bafum, Mache, and south-west to Dama, taking in all the hilly districts, the rains begin early in March and continue until November.

In conclusion, I will attempt to roughly classify the countries mentioned and their future possibilities under two heads, viz.—

1. The high plains from the river Donga east to Garua under the Fula Mohammedan suzerainty.

2. The hilly pagan countries lying to the south and south-east of Ibi.

There are very great possibilities for the former. The country is splendidly fertile, and full of natural wealth. In the not far distant future a great trade should be done in ivory, gum arabic, indigo, kino, skins, gutta-percha, and rice. The importance of the last named in a rice-eating country cannot be over-estimated.

The roads and country, with a very few exceptions, are in a safe and orderly state, thanks to the ceaseless energy of the Royal Niger Company, so well represented by the present senior executive officer of the Benue districts, Mr. W. P. Hewby.

The race to whom the development of these parts so far is due is undoubtedly the Hausa. They are born traders, and will go anywhere and do anything for the sake of trade. Although not belonging to these parts, they are at many places more numerous than the actual natives, and in time must prove the predominating power, the Fulani, the present power, being a fast-dying-out race. It would not be amiss to term the Hausa the Parsee of Africa. He will undoubtedly play an important part in the future development of these regions. The climate is far more suitable to the white man than in any other part of the Niger territories. Once the railway reaches here, and European necessities are easy of access, I do not think I am far wrong in predicting a European colony.

Under the second heading we have a country of a totally different class—vast hilly tracts of land, with a network of forests, and numerous small streams running down into the river Katsena, and sparsely populated by many different pagan tribes. Although full of natural obstacles to development, there are many rich products, the chief of which are rubber, ivory, and timber. The former is found in most of the forests mentioned. Around Kentu, Mache, and west of Dama are extensive rubber countries. Among the chief kinds found might be named the Ireh (*Kixia Africanus*, Benth.), also the flake and ball vine rubbers, and the Balata tree rubber, the latter in small quantities. Of ivory there are large quantities in Dama, and the herds of elephants once hunted around Tibati seem to have been driven for refuge to the Dama wilds. Mahogany, teak, and many other good hard woods are here in abundance, though the present difficulties of transport must naturally delay the development of this trade for some time to come.

Before closing, I might add that every opportunity has been taken to map countries visited. And as Bafum and Dama have never been mapped before, and were in many places unknown to Europeans, I hope

my maps will be of value. The above also applies to the upper reaches of the river Katsena, which I think I can fairly claim to have traced to its source.

NOTE ON THE MAP OF THE BENUE.—The survey has been made with plane-table and prismatic compass, nearly always starting from points previously fixed. Many of the journeys crossed and recrossed each other, which afforded an opportunity of checking the work. The distances were obtained by watch.

MR. JENNER'S EXPEDITION FROM KISMAYU TO LOGH, ON THE JUBA.*

EARLY in the present year an expedition was undertaken by Mr. A. C. W. Jenner, sub-commissioner for Jubaland, through the countries bordering on the lower Juba to the west, as far as the important town of Logh, first reached by the Italians from the north. A report on the routes followed has been made by Dr. William Radford, who accompanied the expedition as medical officer, and this has been kindly placed at our disposal by the Foreign Office. It contains a considerable amount of new information as to the nature of the country, and the present means of communication, with full details as to the supply of water and fodder, and the practicability of the roads for carts or pack-animals. A start was made from Kismayu on February 7, 1899, the upper road, passing at first over the sandhills which fringe the coast, being followed as far as Turki hill, a mile or two from the mouth of the Juba. Beyond Yonti, 10 miles from Turki hill across the plain, there are two roads to the north, the one—very tortuous—running through the whole of the Gosha district, the other keeping more to the west on the open plain. The Gosha road, which was chosen by the expedition on the outward march, twice crosses the Webi Yeru, the arm of the Juba which bounds Twata island on the west. This presents a serious obstacle, as the banks are steep, while in periods of flood the channel contains a considerable body of water. Much of Gosha, especially near the chain of lakes to the west, is covered with forest, which must once have occupied the entire country, though it is now being gradually cleared by the natives for cultivation. The tsetse-fly is found everywhere, but is most prevalent in the neighbourhood of the lakes and thick forest. A means of protection of cattle against inoculation by the fly, in which the natives place much confidence, is a soup made from a species of mud-fish, but there is no evidence whether this is really effective. The western road is practically free from bush, and is therefore not infested by the fly. No water is at present found on this road, but it exists near the surface in at least three

* Map, p. 696.

places. In the rains, however, the heavy soil renders travelling impossible.

The two roads meet at Mibungo-Kisungo, the northern outpost of Gosha, whence also a road strikes west to Afmadu, 43 miles distant. The soil is very rich near the station, and the bush is being rapidly cleared. Further north the road passes continuously through bush, largely composed of African oaks. Several lakes were met with, some containing water both on the outward and return journeys, while others were dry. They are connected by channels with the Juba, and are filled by its flood water as well as by drainage from the surrounding country. The soil of the district consists of clay, with patches of red sand and earth, hard and dusty in dry weather, but very heavy after rain. Paths lead from the road to watering-places on the Juba, which was itself struck at a town named Kaboba. Beyond this the soil shows some alteration, stones and gravel appearing. A plateau runs parallel to the road on the west, at distances varying from 2 to 6 miles. Sugar-loaf hill, about 6 miles from the watering-place at Arnola, is a spur from this plateau running to the river, which it causes to make a sharp bend to the east. There is an upper road across the level plateau, as well as one following the river, the latter being cut by many watercourses running down from the higher ground. After cutting across another spur from the plateau, which causes the river to bend east through a rocky gorge, the road (rough at first) follows the western side of a semicircular loop which terminates near Bardera. Natives usually cross the river and take a direct road across the loop, thus saving at least a day. Saranli, opposite Bardera, lies in a wide plain, across which the road winds towards the north-north-west, afterwards turning west and reaching the summit of the plateau by a gorge 4 miles long, at the bottom of which a "tug" or torrent flows to the Juba. The ascent is rough and steep in places.

The road across the tableland is level and easy, except where the surface is broken by the beds of torrents. The plateau stretches away to the west in an unbroken line, but mountains appear to the north and north-west, and there is an abrupt slope to the river to the east. Isolated hills stand out from the surface in places in bold relief. At Harr, which is distinguished by the number of fine cedar trees, two roads diverge, both being good and well used. At El-Marera, in the Juba valley, they again unite, and the route to Logh lies mostly in the river valley, though the hills approach the river at times, and are then crossed by the road. The country from Saranli to Logh appears to be peculiarly adapted for the breeding of camels, many very large herds being seen, as well as numbers of goats, but comparatively few cattle. Large deposits of salt, with brine-pools, were seen in several places.

Dr. Radford's report contains many details respecting the geological formation of the country visited. Coral rock extends over the whole of lower Juba plain, while limestone first appears near Saloli, and is the

principal rock of the country further north. Basalt and lava also occur between Saranli and Logh. The whole distance traversed on the outward journey, as measured by a revolving wheel, was 409 miles, but much of this length was due to the windings of the road. A more direct road could easily be cut through the bush, as the physical features of the country present no difficulties.

RECENT JOURNEY FROM SHANGHAI TO BHAMO THROUGH HUNAN.

By Captain A. M. S. WINGATE,

I LEFT Peking on September 18, 1898, a few days before the *coup d'état*, and proceeded by steamer to Shanghai, where I engaged a "teacher" and a "taxidermist." From Shanghai I passed up the Grand canal to Kiang-yin, "the key of the Yangtse river," as it is called, and thence to Hankau, visiting all the Treaty ports *en route*. At Hankau I chartered a boat, engaged a couple of servants, and made my final arrangements with the great viceroy Chang-chih-tung for a safe conduct through the notoriously "anti-foreigner" province of Hunan.

I left Hankau on a lovely morning in November—the 8th, a day marked "red" by the murder of Mr. Fleming, an Australian missionary, in the very district through which I was to pass. Of this, however, I knew nothing, until rumours began to reach me many weeks after as I neared the disturbed district. Neither did news of the murder reach any of the British consuls until many days after the deed had been committed, although Kwei-yang city, the capital of the province, is only some 60 miles from the scene of the murder, and is connected with Chung-king on the Yangtse (where the nearest British consul resides) by telegraph. It is ever thus with telegraphs in China; important news which the Chinese "officials" do not wish to leak out is delayed by their orders, the telegraph "operators" being helpless.

I first visited Yo-chu, the new Treaty port (it had not then been opened) at the entrance to the Tung-ting lake, where, as usual with foreigners, we were most warmly greeted by the populace. The fact that the port would shortly be opened made them all the less glad to see me. Thus far we had been towed by one of the viceroy's gunboats, the presence of which helped to prevent the citizens from giving us as enthusiastic a reception as they, no doubt, would have otherwise done.

From Yo-chu we set sail on our own account, and from here my Chinese "teacher" commenced a sketch of the route by the help of a two-foot-square plane-table. This sketch was continued without intermission (except on one day from Chen-yuan, when it snowed so heavily throughout the march that we could not work the table) for over 2000

miles, in spite of rain, snow, fogs, wind, heat, and cold. The scale is 6 Chinese li ($1\frac{1}{8}$ mile) to one inch. I also took observations for levels and weather with two aneroid barometers, and two B.P. thermometers and other instruments by Casella. These were most kindly lent me by Mr. Consul F. S. A. Bourne, an experienced traveller in China, who had used them throughout his journey with the Blackburn Chamber of Commerce China Mission. No sketch has, I believe, ever been made, nor levels taken along this route from Yo-chu to Kwei-yang city; and about 400 to 500 miles is absolutely new country, especially some 200 miles between Yunnan city and Ching-tung *viâ* I-men; and, again, portions of my route from the Ching-tung valley to Ma-li-pa, or Tawnio, as the English maps have it.

The Tung-ting lake is a splendid sheet of water, although very shallow (but in no sense a marsh, as sometimes described) during six months of the year. There can be no doubt that it is slowly and very gradually filling up, especially in the northern half, where the waters of the Yangtse river bring down vast quantities of silt, which is deposited, as the current is checked, on meeting the water of the lake. The original channel, shown on most maps going direct across the lake from Yo-chu to the mouth of the Yuan river, no longer exists; and the traffic is now almost entirely confined to the channel of the Hsiang and Tze rivers, augmented by the ever-increasing tendency which the waters of the Yuan river have to take a southerly course. No doubt a channel does exist across the lake (and the Admiralty should make a complete survey of this important piece of water), but, owing to sudden storms which arise during the summer months, when the waters rise many feet, the boats still keep to the channel along the east and south shores of the lake. The lake contains many varieties of fish, and birds of many species find a home on the shores and islands and sandbanks. Egrets are very numerous, and are, sad to say, much shot by the Chinese for the foreign market. Gulls, and a very large crow, the ring-necked species, abound. I collected some one hundred and eighty specimens of birds, besides fishes, shells (both land and water), and butterflies, all of which have been sent to the natural history section of the British Museum for classification by specialists.

The scenery around the western end of the Tung-ting lake and in the valley of the Yuan river is exceedingly picturesque and beautiful. In some places the river flows through gorges, quite like those of the Yangtse, only on a miniature scale. I noticed one especially below Chen-yuan, where the cliffs on either side rise sheer up some 400 to 500 feet. From within about 100 feet of the top of the right-bank cliff a river flowed straight out of a cave in the rock, forming a waterfall with a good drop. Caves and underground rivers are very numerous along the route after leaving Chen-chu.

It is not quite accurate to speak of the Yuan river above Chien-

yang. It commences here by the confluence of two streams of nearly equal volume, called the Ching-shui and Wu-ho. Both take their rise in the hills east of Kwei-yang; the former, although really the more important river geographically, is, as a trade route, less valuable than the latter, owing to very shallow water during six months in the year a few miles above its confluence with the Wu-ho.

We proceeded up the Wu-ho to Chen-yuan (the head of navigation for large boats), where we arrived at the end of December in very bad weather. This continued for several days, heavy snow falling throughout the day and night, covering the surrounding country to a depth of several inches, and making it extremely uncomfortable marching along the unevenly paved highway which forms the great high-road from Peking to Yunnan city, and on to Bhamo. The Yuan river is extremely difficult and dangerous to navigate, owing to the number and character of the rapids and the numerous sharp rocks. The first of these occurs some 35 miles above Chang-te, but is not a bad one.

In the Chen-yuan district are vast deposits of very rich iron-ore and coal, besides other minerals. In fact, throughout the whole route from Chang-te to Yunnan city coal crops up every few days' march; and supposing a railway were in existence, a coal-supply would be found to exist not far from the line every 100 miles or so, while in places the rails would actually lie on the coal-bed. The coal in the district of Kwei-yang, the capital of Kwei-chu, is of most excellent quality, and I was much struck by the size of the lumps. The only mining done is of the usual Chinese rabbit-burrowing style, but every little village has its own little coal-hole for many days' march west of the city.

On reaching a place called Ching-chi, on the Wu-ho below Chen-yuan, I was astonished to find a complete set of iron-foundry works, with machinery by the best English makers. The works had been closed for some years, and the machinery was rusty and uncared for. The works cost £330,000 to erect. Opposite the works, on the other bank of the river, is a wall of some miles in circumference, which once enclosed a prosperous town of several thousand families, but which now only contains a few officials' houses and a temple or two. It is one among many others which have suffered during the wars which the Chinese have had with the "Miao," or aborigines living in the hills south of the river (Wu-ho).

At Chang-te, in Hunan, the hills first began to appear, and continued without intermission, and gradually growing in size and grandeur, throughout the whole distance to Bhamo, in Burma. Hankau is 196 feet above the sea. Chang-te is, roughly, 300 feet above sea-level, and Chen-yuan 2000 feet; Kwei-yang 3500 to 3600 feet; and Yun-nan 6300 to 6400 feet, so that it is a very steady and gradual rise the whole way from Hankau to Yunnan city. The average height of

the higher peaks of Western Hunan and Eastern Kwei-chu is probably between 3500 and 4500 feet.

The headwaters of the Wu-kiang, or Kung-tan (flowing into the Yangtse at Fu-chu), the Wu-ho, Ching-shui, and Meng-kiang (a tributary of the Wu-ni-kiang, or West river), are all found pretty close together in the hills east of Kwei-chu, between 107° and 108° of E. long., and only a few miles from the high-road.

From Chen-ning (west of Kwei-yang), I followed the older portion of the ancient high-road from Peking to Yunnan city. Just west of Chen-ning it bifurcates, one branch—the more modern one—going north-west *viâ* Langtai and another going south-west *viâ* An-nan. Sixty years ago the chain suspension bridge over the Pan-kiang in this part was carried away by floods, and the road was diverted to the north in consequence. Although the bridge was replaced and is now intact, the traffic keeps to the northern route, because it is slightly shorter and a good deal easier. It is close to this spot where the roads divide that a tributary of the Pan-kiang descends from the plateau to "lower" Kwei-chu by a series of leaps or waterfalls (one of which has a sheer fall of about 300 feet), passing through precipitous gorges, and forming some most beautiful scenery. Both routes unite again just west of Pu-an-ting, on the Yunnan border.

It is interesting to note that the bed of the Pan-kiang, already mentioned, at the point where the road crosses it by the suspension bridge, is the lowest of any river which a bee-line drawn from Kwei-yang to Mandalay crosses; and it is lower than the bed of any river crossed by me during my journey from Kwei-yang to Bhamo. The next lowest is the Red river, or Shih-yang-kiang, west of Yunnan city, on the *direct* route from I-men to Ching-tung. They are only about 1500 feet and 1700 feet above sea-level respectively. The Mekong, at Ta-pong ferry, is about 2500 feet, and the Salwin, at Man-tung ferry, about 2000 feet, while at Kun-lung ferry it is 1600 feet. The above are only very rough estimates, but they serve to illustrate the nature of the country west of An-hsien city, with the exception of that portion of the plateau lying between the border of Kwei-chu and Yunnan city.

The country between I-men (a place three marches south-west of Yunnan city) and Ching-tung is terribly fatiguing to travel over—a continual up and down 2000 to 4000 feet every two days' march. The highest point crossed by me during this portion of the route (and indeed during the whole journey from Hankau to Bhamo) was just east of the Ching-tung valley, where the road reached 8400 feet, and the highest peaks of the range were probably 10,000 feet above sea-level. The next highest range was crossed just west of I-men, at about 8000 feet, the highest peaks being 1000 to 2000 feet above the pass. Taking a bee-line from Yunnan city to Kun-lung ferry, I should put the *average* height of the more important ranges at from 7000 to 8000 feet, and the

ROUTE MAP FROM SHANGHAI TO BHAMO, TO ILLUSTRATE THE JOURNEY OF CAPT. A. M. S. WINGATE 1898-99

Scale of Miles 0 50 100 200

Route .... Route not traversed before ———

average depth of the main river-beds below the general level of th plateau at 2500 to 3000 feet.

In Hunan and Eastern Kwei-chu I encountered considerable opp sition from the people, who objected to my plane-tabling and phot graphing; but we never came to blows, and, all things considered, exce in three or four towns, they behaved very fairly well. Chen-yuan di trict is one of the most disturbed and rowdy. In Kwei-chu and Yu nan no difficulty was encountered so far as the people were concerne They did not seem to care much what we did nor where we went. It quite easy and safe for foreigners to travel in these latter parts. Th Chinese of these two provinces differ in many respects from those of th other eighteen provinces of China. They are inferior in almost ever way; and the further south-west one goes the more useless and besotte do they become. The "Miao," or aborigines, are a better lot than mo of the Chinese thereabouts.

Whole towns have been laid in ruins by the Mahommedan Tai-ping and "Miao" rebellions. Especially is this the case between Yuan-chau in Hunan, and Kwei-yang city. Yunnan and Kwei-chau will tak hundreds of years, even with the help of Western nations, to recove their former prosperity, and several generations must elapse before th natural resources and mineral wealth of this part of China can be fully utilized and developed. But the latent wealth of Kwei-chau is evident and its former prosperity shown by the size of the ruined towns.

There can be no doubt that the valleys of the great rivers west o Yunnan city and south of the Yunnan Bhamo trade route are extremely unhealthy. I and all my followers enjoyed excellent health until we got west of I-men. From that place onward, until we had crossed the Salwin, we were constantly prostrated by malarial fever, and suffered great lassitude and depression when camped in the valley bottoms—a thing we avoided doing as much as possible. The valley of the Papien is among the worst in this respect. We met the first "Pa-i," or "Shans," and "Pongys," or Burmese priests, at a village one march north of Wei-yuan. They extend some way north along the west bank of the Mekong, but are not found east or north of the Wei-yuan district.

It was my original intention to have kept as near as possible in a bee-line from Shanghai to Mandalay; but on arrival at a place called Meng-kon, south-east of Kun-lung ferry, I found some savage tribes called "Ke-wa" (nearly allied to the Nagas of the hills south of the Assam valley), who objected to my traversing their country, so I was obliged to turn northwards, and direct my footsteps to Bhamo instead.

At Ma-li-pa, or Tawnio (a place two marches north of Kun-lung ferry and two east of the Salwin river), which place we shortly after reached, I again set foot on British soil. Here I met Mr. Scott and the northern party of the Burmese-Chinese Frontier Commission. Although,

between Kwei-yang and Yunnan cities, we had met several missionaries, both British and French, all of whom were most hospitable and kind, we had been on two occasions (first between Hankau and Kwei-yang, and then from Yunnan city to Ma-li-pa) nearly two months without seeing a white face.

Three things impressed me greatly during my journey through China. Firstly, the opulence, thriftiness, prosperity, and spirit of the Hunanese, and the mineral and agricultural wealth of their province; secondly, the poverty, degradation, squalor, and want of energy of the very scanty population of Kwei-chu and Yunnan, especially South-west Yunnan; thirdly, the length of the Chinese "arm of the law," and the extraordinary way in which the Chinese Government manages to keep 350,000,000 people in fairly good order with a mere handful of so-called soldiers and a few scoundrels called "police"—so much so that only some fifteen to twenty years ago they subdued many tribes of Shans and "Ke-was" on the south-west border between the Salwin and Mekong, and took over the administration by means of political agents of large tracts of country which was formerly under quite independent rulers.

To those interested in the geography of China, it may be worth noting that, while the distance between Hankau and Bhamo along the route followed by me is, according to the best maps of China, roughly 1500 miles, the actual distance traversed according to my sketch is some 2360 miles.

Again, the distance from I-men to Ching-tung is shown on the maps as about 75 miles; I found we had to walk nearer 200 miles, which occupied us nine hours a day for ten days, excluding halts. This affords some idea of the difference between the distance as measured on a map of China and the actual length of route to be traversed, and shows how, in estimating the possibility of railway construction in Western Yunnan towards Sechuen, a very liberal allowance should be made in calculating distances from the map alone. I made no remarkable geographical discoveries, as this is difficult to do in a country possessing excellent maps drawn in great detail. Where the Chinese maps chiefly fail is in the indifferent manner in which they are drawn, and in the absence of proper scales. They are particularly inaccurate west of the Mekong and south of the Yunnan Tali Bhamo route.

From Ma-li-pa, or Tawnio (as the British maps have it) we again set out for Bhamo, following more or less the line of the newly demarcated frontier. We reached that trading depôt on April 20 last. From Bhamo we took boat in a steamer to Mandalay, and thence proceeded by train to Rangoon.

The following may prove of interest. During the journey from Hankau to Bhamo, between November 8, 1898, and April 20, 1899,

the thermometer ranged from 30° to 92° Fahr. in the shade. We experienced every kind of weather from bright clear sunshine and cloudless skies to dull dark days accompanied by fogs, mist, rain, snow, sleet, hail, frost, cold bleak winds, or hot fiery blasts. On the whole, except Manchuria and perhaps Kashmir, I know no part of Asia so suited to the people of Western nations for prolonged residence than the hills in the west of Hunan, and the plateau of Kwei-chu and Yunnan.

We had travelled from Hankau to Bhamo, about 2360 miles, of which about 880 were by water and the balance, 1480, by land. Excluding halts, we managed 13½ miles a day by boat against the current and with numberless rapids, over each of which it required from fifteen to twenty trackers to haul the boat; and by road we averaged 18¼ miles a day, including halts. We were 130 days actually on the march by river and road. During that portion of the journey between Kwei-yang and Bhamo, we went up and down over 2000 feet more than twenty times; while on eight occasions we went down 3000 feet and up again a similar height in a distance of only 10 miles. These figures speak for themselves, and give some idea of the very mountainous character of Kwei-chu and Yunnan provinces.

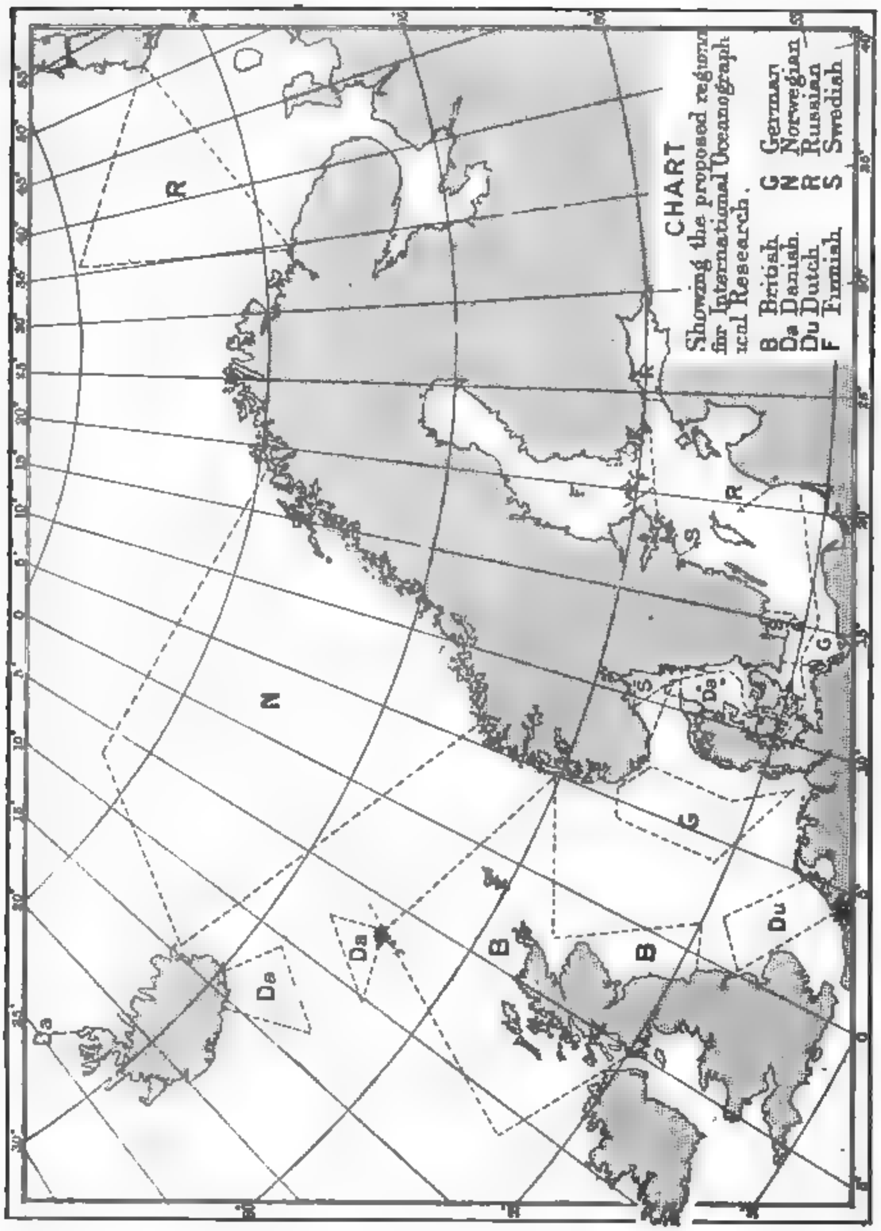
There is a fine field for the scientific explorer and for the artist and sportsman in Hunan and Kwei-chu; the rivers of the former province would delight the fisherman's heart. Even in Yunnan very little is known of the mines, especially the gold-mines, although gold undoubtedly exists in Hunan and Yunnan in not inconsiderable quantities.

I took with me a quarter-plate hand-camera as well as a full-plate camera, and out of about 220 full plates I got some 75 per cent. of fair negatives, and about 50 per cent. of the 550 quarter-plates came out satisfactorily.

INTERNATIONAL OCEANOGRAPHICAL RESEARCH.

In June last an International Conference was held at Stockholm, on the invitation of the Swedish Government, for discussing joint action in establishing observations on the North Atlantic, North sea, and Baltic, in the interest of fisheries. Representatives of the eight northern maritime nations were present. Germany sent four representatives, including Prof. Krümmel, of Kiel; Denmark three; the United Kingdom three, viz. Sir John Murray, Prof. D'Arcy Thompson, and Mr. W. Archer; Norway three, including Prof. Nansen and Dr. Hjort; Holland and Russia one each; and Sweden six, including Profs. Pettersson and Cleve and Mr. Ekman. The work of the Conference was divided into the consideration of three groups of proposals: (1) as to periodic scientific investigations in the sea; (2) as to special investigations required for particular fisheries; (3) as to establishing relations between the

different marine stations regarding some important biological questions. Five general meetings were held, and the whole question thoroughly



discussed, both in these sittings and in committees. The final results of the Conference are published in the official report in English and

German. It was resolved to recommend to the several governments a system of investigation which should extend over five years, and be carried out with regard to oceanographical and biological considerations. The nature of the various observations was laid down in some detail. The oceanographical (or, as it is termed in the report of the Conference, *hydrographical*) work should have for its object the distinction of the different water-strata, according to their geographical distribution, their depths, their temperature, salinity, gas-contents, plankton and currents, in order to find the fundamental principles, not only for the determination of the external conditions of the useful marine animals, but also for weather-forecasts for extended periods in the interests of agriculture.

The observations ought to be carried out by the different countries as far as possible simultaneously, and in the four typical months—February, May, August, and November. The instruments must all be of the same pattern, and particulars are given as to the various units to be employed in publications. These are the sea-mile, the metre (though depths in fathoms may be added), the Centigrade degree, and longitudes reckoned from Greenwich. The work shall not only include observations at sea, but also physical and chemical work in laboratories on shore. The observations should be made on each occasion along certain lines by the various countries co-operating in the work. The suggested division of labour is shown in the accompanying chart.

The biological work should include studies of the life-history of fishes, with special regard to their distribution and migration, and for this purpose experimental methods must be adopted for catching and marking individual fish, so that they may be recognized when recaptured.

The organization of a central bureau is necessary, provided with a laboratory for oceanographical and biological work, and its functions are thus defined:

(*a*) To give uniform directions for the hydrographical and biological researches represented.

(*b*) To control the apparatus and to ensure uniformity of methods.

(*c*) To undertake such particular work as may be entrusted to it by the participating governments.

(*d*) To publish periodical reports, and papers which may prove useful in carrying out the co-operative work.

(*e*) To decide the graphic representation, scales, signs, and colours to be used in the charts for the purpose of obtaining uniformity in the publications.

(*f*) To make, in connection with the investigations, application to the telegraph administrations for the purpose of obtaining determinations from time to time of the changes in the resistance of the cables which cross the areas in any direction.

The central bureau is to be situated in some convenient centre for oceanographical work, and is to be under the control of an international council, appointed by the various governments which supply the funds for carrying on the work. The staff of the central bureau shall consist of a highly paid general secretary and a principal assistant, one of whom must be an oceanographer, the other a biologist; a president and vice-president, who receive nominal grants in payment of expenses; and various assistants. The annual expenditure is estimated at nearly £5000.

It is suggested that the investigations should be commenced on May 1, 1901. As preliminary desiderata, the Conference suggests that attention be called to the importance of having telegraphic communication with the Færoe islands and Iceland; and that the various constants of sea-water should be experimentally re-determined, funds for the purpose being sought for from learned societies. An appeal made to the British Association has been responded to by a grant of £100 for the determination of the physical and chemical constants of sea-water, so that unofficially this country has been the first to move in the general plan of conjoint research.

BARTHOLOMEW'S PHYSICAL ATLAS.*—A REVIEW.

By HUGH ROBERT MILL, D.Sc., F. R. Met. Soc.

SINCE the publication of the second edition of Dr. A. Keith Johnston's Physical Atlas in 1854, no work has been produced in this country dealing with physical geography as a pure science in any way comparable with that which now lies before us. Even the admirable meteorological atlas compiled by Prof. Hann for the last edition of Berghaus' *Physikalische Atlas* in 1887 has been far outstripped, and the enterprise of Mr. Bartholomew has placed to the credit of British cartography the first instalment of a monumental work unrivalled in any land.

The new Physical Atlas is so far based on Berghaus that the right to utilize any of the plates in that splendid series has been secured; but in this first volume the number of maps adapted from the German work is relatively small. In choice and compilation the Atlas is substantially new, and the study of its plates cannot fail to surprise even skilled geographers with the amount and solid value of the data of modern meteorology. The editor, Dr. Buchan, himself the author of many of the maps, does not hesitate to say that of all departments of

* Bartholomew's Physical Atlas. Vol. iii. Meteorology. A series of over four hundred maps, prepared by J. G. Bartholomew, F.R.G.S., and A. J. Herbertson, PH.D., and edited by Alexander Buchan, LL.D., F.R.S. Prepared at the Edinburgh Geographical Institute, and published by Archibald Constable & Co., Westminster. 1899.

physical geography, that dealing with the atmosphere so far from being the least advanced, as has long been popularly believed, is, on the contrary, far ahead of such sciences as geology and biology as regards distributional problems. The task of preparing the Atlas has been performed, under the editorial supervision of Dr. Buchan, mainly by Dr. A. J. Herbertson, who has compiled many of the maps, especially those of rainfall, from new data. One of the features of the Atlas, and one not universal in cartographic work, is the scrupulous acknowledgment of the sources of all the maps, with particulars as to the manner in which they have been prepared.

If there is any criticism of an adverse kind which might justly be made, it is perhaps that the theories of meteorology have not received the recognition which they deserve. Dr. Buchan lays stress on the fact that the maps are based "on the patient and long-continued labours of myriads of observers in all parts of the world, dealt with and discussed on purely inductive methods," and this of course gives them a permanent value as records of observed fact. But we think that, in addition, a few of the more theoretical deductions would have proved useful. Some such there are, in the shape of diagrams showing the isotherms in a vertical section of atmosphere along certain meridians and parallels. Others might have illustrated the theory of atmospheric circulation on a uniform sphere, the vertical circulation of air in cyclones and anti-cyclones, and in cases where discordant theories exist, the presentation of each could do no harm. Yet a record of observed facts, mellowed only by so much of theory as is required for reducing pressures and temperatures to their assumed values at a standard level is unquestionably the most valuable if a choice has to be made.

So important did the Physical Atlas appear from its initial plan that the Royal Geographical Society gave its special imprimatur to the work, and the Fellows of the Society received the privilege of purchasing it at a reduced price, a privilege the period of which has now expired. Its price to the public is, however, so low that no one need be deterred from purchase who cares for such study.

The maps throughout bear the figures of the ordinary British units—inches and Fahrenheit degrees—as well as of the continental units of millimetres and centigrade degrees, so that their use should help to familiarize those using each system with the other.

A frontispiece shows the distribution of the meteorological stations from which the data for the four hundred maps were obtained, and thus indicates the regions over which the curves of the maps have been drawn with the greatest confidence.

The maps deal with two distinct subjects—*Climate*, or the normal distribution of warmth, pressure, wind, and rainfall; and *Weather*, or the actual distribution of these phenomena at particular times. The climatological work includes maps of the world on a fairly large scale,

showing the mean distribution of the year, on a smaller scale for the mean distribution of every month. Special maps on a very much larger scale are given for Europe, North America, the circumpolar region to 50° N., the United States, the British Islands, India, South Africa, and Eastern Australia. In each case such maps are given for the annual and the monthly distribution of temperature and of rainfall, while for most of them the normal distribution of pressure is treated in equal detail. Several hundred maps are thus accounted for, but in addition there are special maps of climate zones, of isanomalous temperatures (showing how far the temperature at each point differs from the theoretical temperature which would prevail if there were no disturbing interactions between land and sea), and special large-scale charts of wind-direction over the ocean at opposite seasons. Perhaps the most striking and self-explanatory of all the exquisitely coloured plates in the atlas are those showing the distribution of sunshine and cloud for the year and for every month. The sunny regions stand out in clear blue separated and surrounded by the regions of clouds, which deepen in tints of brownish grey towards the poles, the whole presenting a series of belts and spots curiously like those of the planet Jupiter.

The weather maps, necessarily less numerous, are even more interesting, for they are less familiar than climate maps. Here selection had to be exercised, and the compilers and editor deserve congratulation for their judgment. Maps are given of the chief storm-tracks of the world, showing the relative frequency of the storms. Special regions where cyclonic storms are particularly frequent, as in Western Europe, or severe, as off the West Indies, Madagascar, in the China sea, the South-Western Pacific, and the Missouri-Ohio valleys, are given on a larger scale and for different seasons. There are also many maps showing the conditions at specially interesting times over well-known regions, such, for example, as the day of highest and that of lowest recorded pressure over the British Islands, the month of lowest and that of highest mean temperature ever recorded in Europe, and the like.

Directions for reading the maps and a full description of each map are given in the introductory letterpress, and at the end as appendices are a list of the meteorological services of the world and their publications, a well-selected Bibliography carefully classified, a glossary of meteorological terms, and some useful tables.

Only one great region of the world is totally neglected. Every map of the world terminates nebulously to the south, and there is not a single map of the distribution of pressure, temperature, or precipitation over the south polar area. The absolute ignorance which reigns as to the physical geography of the antarctic regions has never been more plainly expressed than in this compulsory exclusion of all data. It is to be hoped that the reception of the Atlas will justify many new editions, in which the approaching unveiling of the antarctic will demand more and more

south polar maps, and contribute to the elucidation of the atmospheric geography of the world.

Other volumes of the Physical Atlas are in preparation, and will appear as each is completed. They will deal with Geology, Orography and oceanography, Botany, Zoology, Ethnography and demography, and General cosmography and terrestrial magnetism.

THREE RECENT BOOKS ON CHINA.—REVIEW.

By GEO. G. CHISHOLM, M.A., B.Sc.

Of all the commercial missions to which the immediate prospect of the development of the resources of China by modern methods has recently given rise, the most fully equipped and that with the most extensive and elaborate programme is that organized by the Chamber of Commerce of Lyons, and the report published by the director of this mission, Mr. Henri Brenier,* is of corresponding interest and value.

In organizing the mission, the Lyons Chamber of Commerce had the active assistance of those of five other towns, Marseilles, Bordeaux, Lille, Roubaix, and Roanne, and the members of it included representatives of all the most important branches of the national activity. They numbered twelve in all, including the director, the doctor, and Mr. Rocher, the well-known member of the French consular staff in China, who was associated with the mission by the French Government. The mission was immediately prompted by the treaty of Shimonoseki at the conclusion of the Japo-Chinese war, and set out on September 15, 1895, just five months after the signing of that treaty. The last members to return reached Marseilles in the same month in 1897. The intervening months were devoted to journeys in French Indo-China and the neighbouring provinces of China, but including very extensive journeys in the province of Sechuan up to its western and north-western limits. These journeys were not made by all the members of the mission together. From time to time the mission was broken up into separate parties to make inquiries along different routes, or to enable members representing particular branches of industry to make a special examination of the regions of more peculiar interest from the point of view of those industries.

The first part of the report contains, besides a general introduction and other preliminary matter, accounts of the various journeys made by the members of the mission, while the second part is made up of commercial reports on Tongking (with some notes of commercial interest with regard to other parts of French Indo-China); on the separate

* 'La Mission Lyonnaise d'Exploration Commerciale en Chine, 1895–1897.' Lyons, 1898. 8vo. One volume in two parts, pp. xxxvi., 386, and 470.

provinces Yunnan, Kweichu, and Sechuan; on Hongkong, Canton, and Hankau; on mines and metallurgy; on silk; on cotton and cottons; on oils and fatty substances; and on the Chinese monetary system, followed by an appendix containing notes on various points, and a chapter embodying general conclusions.

The volume is illustrated by a large number of excellent engravings, mainly from photographs taken by the mission, and, in addition to a sheet showing road profiles, there are eight maps on various scales. One of these is an economic map of China indicating the relative importance of the dependencies of the chief commercial centres of distribution and collection, another indicates the products and means of communication in Indo-China, a third shows the distribution of sericulture in Sechuan, a fourth (on a large scale) the rapids of the Red river (Song-koi) between Yenbai and Laokai, and the other four are maps of the provinces most thoroughly examined by the members of the mission, these last (on the scale of 1: 2,500,000, or 1: 2,600,000) showing, besides the physical features, the routes followed, the chief products of different districts, and in some cases the extent of the river navigation. On this head a good deal of new information was collected by the mission, and on the maps this is partly indicated by anchors of different form; but, unfortunately, the meaning of these different anchors is not stated under the explanation of the conventional signs, so that one has to guess it or collect it from a search of the text, for which one has not the assistance of an index.

The value of such a work as this consists mainly in its details, which cannot be summarized, but it may be worth while to call attention to two or three new or newly discovered facts to be found in its pages. The two principal geographical discoveries which Mr. Brenier claims for the mission—the ascertainment of the fact that the Patu-ho, or upper Hungshui, which he designates as the middle branch of the Si-kiang, forms for about 125 miles the boundary between the provinces of Kweichu and Kwang-si (pt. i. p. 88), and the final determination of the fact that the Kuchu-ho, or river of Luichou-fu, is the true headstream of the Si-kiang, in so far as it carries down a greater volume of water than any of its rivals (pt. i. p. 328)—have already been briefly noticed in the *Journal* (vol. xi. pp. 179, 180). In western Sechwan some members of the mission, in going from Kwan-hsien to Tatsien-lu, or more precisely between Tien-tsuen (near Yachu-fu) and Luting on the Tung-ho, followed a road that had never been taken by any Europeans before—and (says Mr. Brenier) with good reason, for it was all through the most difficult mountainous and forest-clad country, in which the chairs of the party were broken, two thermometers smashed, and one of the party nearly precipitated to the bottom of a ravine. Among the present signs of the times in China, Mr. Brenier mentions that the emperor has recently signed a decree which completely reforms the basis of the

examinations on the results by which the entrance to official life depends, ordaining that in future the candidates shall be examined in the European sciences. This, remarks Mr. Brenier, may have incalculable consequences, and as one result of this modern tendency he quotes the following recent examination question:—

"The tea trade is important, and occupies a considerable number of people. Indicate the means by which that trade might be improved in such a manner as to bring the profits to the Chinese instead of to foreigners" (pt. i. pp. 214, 215)

—a question of a kind that might fairly be expected in the projected university of Birmingham.

Most of the oversights that occur here and there in the volume are of such a nature as to mislead no one, and among these we may include the statement that the central parts of Sechuan are very thinly peopled (*très peu peuplées*, pt. ii. p. 233)—a statement which is expressly contradicted elsewhere in the book (as on p. 256, n.), and which seems to have arisen from the unintentional and unobserved duplication of the first syllable in *peuplées*. Another slip, if slip it is, is more perplexing, as it leaves the reader in doubt on a point of some importance. It is stated (pt. ii. p. 101, n.) that, including charges for transhipment, insurance, etc., but excluding customs duties, the cost of carriage from Hong-kong to Mungtse (or Mengtse) by the Red River route is 225 francs per ton, but the context seems to show that not Mungtse, but Yunnan-fu is meant.

The new botanical work which Dr. Bretschneider has paid us the compliment to publish, like most of his previous works in English, is a large book in two volumes, but paged consecutively. Its scope is sufficiently indicated by the full title given below.* Under the names of the different persons who have added to our knowledge of Chinese botany in any way, whether as travellers, scientific botanists, gardeners, or nurserymen, from Marco Polo downwards, it notes the additions which they have made, and it furnishes also longer or shorter biographical notes as to the persons to whom we are thus indebted. The notices of Robert Fortune and Père Armand David among others are particularly full and interesting. The arrangement is partly chronological, but the different travellers, etc., are also grouped according to nationality, or according to the nationality of the expedition to which they were attached. The copy which the author has presented to the Society contains one or two manuscript additions by the author, as well as corrections of the typographical errors noted at the end of the second volume.

* 'History of European Botanical Discoveries in China.' By E. Bretschneider, M.D., late Physician to the Russian Legation at Peking, Corresponding Member of the French Institute, etc. London: Sampson Low (printed at St. Petersburg), 1898. 8vo, pp. 1168.

The volume on the province of Chekiang,* which has been compiled by Dr. Carli, avowedly contains nothing new, but it is the most complete account of this province that has been published. As the title indicates, it is primarily a study in economic geography. It may be looked upon as a companion volume to Richthofen's 'Schantung,' having been prepared to draw the attention of the people of Italy to the region in which the Italian Government is now seeking to secure a settlement on Sanmun, or, as Dr. Carli uniformly spells it, Sanmen † bay, to obtain a concession for a railway connecting that bay with Poyang lake in the adjoining province of Nganhwei, and in other ways to establish an Italian sphere of influence. It opens with an introduction (pp. 1–71) giving an account of Chinese relations with the Western world, and latterly Japan, from the time of the first Portuguese expedition in 1516. In this section it may be noted that in more than one place (pp. 15, 58, 67, etc.) a recognition, not always accorded by foreigners, is paid to the liberal spirit of English commercial policy. It is pointed out, indeed (p. 59), that a different policy has recently been followed on the parts of the Chinese empire adjoining British territory, as, for example, in the region bordering on Burma, with respect to which the British have secured for themselves similar privileges to those obtained by the French in their territories in Indo-China; but it may be observed that such privileges wear a different aspect where the front door for commerce is kept open, as at Rangoon, from that which is presented where the front door is more or less closed, as at Haifong or Hanoi.

This introduction is followed by a general account of the province of Chekiang, and that by a section on money, weights, and measures, and the interpretation of statistical data. On this head, while paying a warm tribute to the publications of the Imperial Maritime Customs, it draws attention (p. 89), as is also done in the report of the Lyons Mission (vol. ii. p. 175), to the misleading character of the statistical reports of that body in respect of the trade of Hong-kong, which is all classed as British. Dr. Carli suggests that it would be easy and much better to name in connection with the Hong-kong trade the European (or other) port of destination or origin of that trade, adding "*viâ* Hong-kong."

There then follows a chapter on the four principal rivers of Chekiang, giving particulars with regard to the navigation both of the main streams and their tributaries, and the principal products conveyed on them. This is succeeded by one on the coasts of the province, another on the means of communication apart from the rivers, another on the general products of the province, and separate chapters on the three treaty

* 'Il Ce-kiang, Studio geografico-economico del Dr. Mario Carli.' Rome, 1899. 8vo, pp. xx., 278.

† The name, it is stated, means "Three Harbours."

ports of Hang-chu, Ning-po, and Wen-chu, and their trade. Lastl there is a statistical appendix, including the tariff annexed to the trea of October 26, 1866, between Italy and China. A map on the scale 1 : 500,000, based chiefly on that in the report for 1882 of the Imperi Maritime Customs, is attached to the volume. There is no index, but very full table of contents and numerous marginal headings facilita reference. There are frequent citations of authorities, but these for tl most part are not precise, and include even such vague and unsatisfacto references as 'Consular Reports, Washington,' and 'Diplomatic ar Consular Reports on Trade and Finance, Annual Series' (without an number).

'THE INTERNATIONAL GEOGRAPHY.'*—REVIEW.

By Major L. DARWIN.

THIS work represents a new and valuable departure in geographica literature. A number of prominent authors have, no doubt, often combined together to produce some important work, but this is probably the first geographical text-book which has been compiled in this manner. Space forbids an enumeration of the different writers, but a sample taken at random will suffice to indicate the character of the whole work. Looking in the list of authors under a single letter of the alphabet, we find that Sir W. MacGregor writes on New Guinea, of which he was governor; Sir Clements Markham, president of the Royal Geographical Society, writes on Ecuador, Peru, and Bolivia; Mr. Mason, the collaborator, with Mr. B. H. Chamberlain, of Murray's Guide to Japan, gives an account of that country; Captain Mockler-Ferryman describes Nigeria, a country he has studied on the spot; Dr. T. Muir, the Superintendent of Education in the Cape Colony, writes on the Cape; Dr. H. R. Mill, the editor, discusses the principles and progress of geography, land forms, the United Kingdom, etc.; Sir John Murray writes on the Oceans, and the Antarctic Regions; and Mr. Myres describes Tripoli. In fact, the list of authors is alone sufficient to guarantee the great value of the work. The book is divided into two parts: the first, of about 120 pages, deals with "the principles of geography and their applications in the most general sense"; the second, of over 900 pages, includes a description of all the countries of the world, each written by a writer with special knowledge of the locality in question.

The first of these parts is perhaps almost too condensed, though it must be admitted that the allotment of space in such a work is an exceedingly difficult task. There are numberless persons to whom

* 'The International Geography, by Seventy Authors.' Edited by Dr. H. R. Mill. Newnes.

books of travel are the most fascinating reading, but who can with difficulty be induced to study geography systematically; and the editor may have been right in not straining the patience of such students by too long a preliminary investigation of principles before passing on to the actual description of the countries themselves. In addition to the articles already mentioned, Dr. Downing treats of mathematical geography, and gives, amongst other information, a short description of the chief methods of map projection; Mr. Ravenstein writes on maps and map reading; Dr. Gregory gives a brief but interesting account of the theories which have been put forward by various authors to account for the "plan of the earth," or the main distribution of land, water, and mountain chains; climate and atmosphere are dealt with by Mr. H. N. Dickson; the distribution of living creatures by Prof. J. Arthur Thomson, and of mankind by Mr. A. H. Keane; and Dr. J. Scott Keltie discusses political and applied geography.

In the second part, each country is described by "an experienced traveller, a resident, or a native," in the following order: general configuration, climate, natural resources, fauna, flora, inhabitants, manufactures and trade, political divisions, and statistical information. The fact that all the articles are written with that vividness which is only possible when they flow from the pen of one who has actually travelled in the countries he describes, certainly makes these systematic descriptions both more attractive and more valuable than the ordinary editor-compiled geographical hand-books.

Thus the very nature of the book almost defies criticism as a whole; for, if any section is to be criticized with any effect, it must be by an expert of experience equal to that of the author of that part; and to collect such an array of critics would be a task comparable in difficulty to the compilation of the volume. I should like to have seen this volume accompanied by an atlas, of exactly the same size, and giving *all* the names of places mentioned, with but comparatively few others. As a text book, it is sufficiently valuable to justify the publication of a collection of maps specially designed to assist the reader; and the reader would best be assisted by not having to search for one name amongst a crowd of others. The editor tells us in the opening page that the size of the volume has been kept within its present limits by "sacrificing such details as may be found better expressed in the maps of an atlas." This is a perfectly sound principle, which has not been quite sufficiently attended to by all the authors, and which would be more easily followed if the book were accompanied by an atlas to match. For instance, Mr. James Bryce, who is generally a perfect master in the art of geographical description, tells us, in an article to which many readers will turn at once, that the Transvaal is "bounded on the east by Portuguese East Africa"; a fact which the student of

geography should learn to read at a glance from a map, and not from written description. One last criticism may perhaps be suggested. I appears to me that some geographers are under the impression tha their science is dignified by the introduction of technical terms, an fail to recognize that the invention of a new scientific word is always positive evil, to be avoided if possible. But this is a controversia point, to pursue which would probably have no other effect than t bring me under the censure of one or two of the many prominent geo graphical authors of this most valuable volume.

THE MONTHLY RECORD.

EUROPE.

The Caves of Yorkshire.—Notes on the caves of a portion of the West Riding of Yorkshire are contributed by Mr. S. W. Cuttriss to the *Proceedings of the Yorkshire Geologic and Polytechnic Society* (N.S., vol. xiii. pt. 4). Mr. Cuttriss divides the area under consideration into three geological divisions, viz. the Yoredales, the southern Carboniferous (between the upper and middle Craven faults), and the main Carboniferous within certain limits. The present notes are concerned with the last-named section, which is the most interesting as a field for studying the action of water on limestone, and the effect of the underground watercourses, on the general drainage of the district. The Leck Fells, Kingsdale, Chapel-le-dale and Ribblesdale fall within its limits. The contrast between the caves of this section and those of the southern Carboniferous is very marked, especially by the almost universal presence in the former of an active drainage channel, and the abundance of pot-holes, which are entirely absent in the latter. The caves may be classed as caves of engulfment and caves of debouchure, only the former, with one exception, occurring in the Leck Fell and Kingsdale districts; while in Chapel-le-dale and Ribblesdale the principal caves are those of debouchure, which far exceed the others in number. Caves of engulfment are usually low and soon terminate, either in a pool or the side of a pot-hole, or by the roof descending to the water or to the loose stones which obstruct the channel. Caves of debouchure have usually commodious entrances. In the whole district only three caves are known to Mr. Cuttriss in which it is possible to complete the journey from daylight to daylight, and each of these ends in a pot-hole. The latter part of the paper is devoted to these holes, which are, Mr. Cuttriss says, of far greater interest than the caves. In 1896 he formed one of a party, including Mr. E. Calvert, which completed the survey of Gaping Ghyll, first explored by M. Martel (*Journal*, vol. x. p. 509) in 1895, at which date Mr. Calvert's preparations were actually in progress. A still deeper hole than Gaping Ghyll is Rowten Pot in Kingsdale, which was first descended (after several unsuccessful attempts) by Mr. Cuttriss and several friends in July, 1897. About 100 feet from the surface a natural bridge spans the gully, while at 235 feet the bottom of the main chasm is reached, after two waterfalls have been passed. Lower down other waterfalls occur, while the lowest point of all, 365 feet below the surface and more than 20 feet below the bottom of the valley itself, is reached by winding passages. The whole undertaking occupied over fourteen hours. Diagrams and photographic views illustrate the paper.

Ancient Settlement in Kerry.—In the *Transactions of the Royal Irish Academy* (vol. xxxi. pt. 7), Mr. R. A. Stewart Macalister gives the results of a careful survey, made during three extended visits, of an interesting group of ancient

ruins on the coast between Ventry harbour and Dunmore head, about 10 miles from Dingle. Although in many respects of unique importance, these remains have met with comparatively little attention, the only printed attempt to give a general description of the site being that of Du Noyer (1858). Even the recently published 25-inch Ordnance Survey map indicates only a portion of the existing remains. Taking this map as a basis, Mr. Macalister surveyed the site field by field, and constructed a map including every ancient structure of any importance, much care being taken to distinguish these from buildings of possibly recent date. In the first part of the paper the writer describes in turn each of the structures examined, while in the remaining sections he discusses the character of the settlement, its probable inhabitants and date, and so forth. While not entirely coinciding with Du Noyer's views, which regarded the settlement as a primitive pagan city, Mr. Macalister more decidedly negatives the idea that it was a *laura* of Christian monks, from which it differs in several important respects, notably in the existence of multiple "clochans," which point unmistakably to family life. Although the structures bear abundant signs of defensive considerations, there is nothing to imply corporate organization or combination for purposes of protection, the separate groups probably living in mutual suspicion. As regards the inhabitants, little light is thrown by the study of the modern population of the district, as there is no proof of historic continuity; nor is much help afforded by the present nomenclature or by local tradition, which is extremely meagre. Although a continuous development of the early structures is noticeable, there is an unbridged gap between the latest of these and the cabin of the modern peasant. From the evidence of the remains themselves, Mr. Macalister concludes that the people kept sheep and goats, eating the flesh and spinning the wool; hunted rabbits and hares, and probably boars; and cultivated grain. He found evidence, not before noticed, that the settlement existed after the introduction of Christianity, though there are certain indications that the new religion was at first contaminated with the mysteries of the ancient beliefs. He therefore concludes that the "clochan" period of the settlement begins from a date somewhat anterior to the introduction of Christianity, extending however down to a comparatively recent date in the middle ages. The "duns," or great forts, which are found at the two extremities of the settlement, are regarded as originally belonging to the series of fortified headlands, due to an ancient race much older than the people by whom the bulk of the structures were made. The writer concludes with criticism of the course at present pursued with regard to these and similar ancient remains.

Festival of the Geographical Association at the University of Vienna.—On October 28 last, the Geographical Association—the oldest scientific institution of its kind among Vienna University students—celebrated the twenty-fifth year of its existence by a gathering in the buildings of the University. The Association publishes an Annual Report, in which the most valuable of the papers read at the meetings are printed; while by exchange with kindred institutions throughout the world, as well as by presentations and purchase, it has accumulated a library, which is a valuable aid to geographical study. In addition to those more immediately interested, including Profs. Penck and Tomaschek, and Colonel Hartl, lately called to the chair of geodesy at the Vienna University, there were present at the festival a representative of the Ministry of Education; Prof. Suess, President of the Imperial Academy of Sciences; Prof. Neuman, Rector of the University; and many past members of the association. After introductory addresses, a paper was read by Dr. Robert Sieger on "Anthropo-geographical Problems in the Alps," in which the relation between the form of the surface and the course of roads and boundaries was dealt with in a systematic manner. The proceedings terminated with a social gathering.

ASIA.

Return of Captain Deasy.—Captain Deasy has returned from Central Asia to India, where, he informs us, he is now engaged in working out the results of his surveys at the headquarters of the Survey of India at Dehra Dun. There is reason to believe that they will bring about many improvements in the maps of the countries traversed by him. We hope to have from him a detailed account of his travels on his arrival in this country.

M. de Déchy's Journey in the Caucasus, 1898.—Our honorary corresponding member, M. Maurice de Déchy, last year renewed his explorations in the Caucasus, accompanied by Dr. Hollos as botanist, Dr. Papp as geologist, and a Tyrolese guide. The first district visited was that about the sources of the Kuban in the western part of the range. After some ascents by way of the Chirikol glacier, the travellers separated in the Upper Uchkulan valley, M. de Déchy's companions crossing the range by the Nakhar pass, while the leader, accompanied by the guide, ascended the Gandarai valley and crossed the main ridge into the trackless wilderness of Abkasia. Here, as further east in the valleys belonging to the Ingur and Rion systems, the traveller is struck by the wonderful development of the vegetation, while rushing streams are seen on all sides. The main crest of the range consists of gneiss, granite, and crystalline schists, varying in composition in different localities. The way to the Nakhar pass (9620 feet) leads up by a succession of well-marked steps of granite and mica-schist, with small ice-lakes. The section of the main ridge between Elbruz and the Klukhor pass shares the majestic character of the higher Caucasus, the sides being precipitous, and the peaks sharply cut, though lower than those of the central part of the range. Important glaciers descend to the narrow northern valleys. The travellers met again in the valley of the Kluch (Kodor system), and crossed the range northwards by the Klukhor pass, visiting some glaciers to the west, in which direction they become smaller. The projected ascent of some of the peaks was prevented by the illness of the guide, who had to be sent home to Tyrol. A search for fossils in the schists of the Teberda and Kuban, with a view to solving the problem of their age, proved fruitless. The travellers now turned their steps eastward, and visited the mountains of Southern Daghestan. Here they were struck with the rapid progress of valley formation by means of erosion, in which respect a strong contrast is observable with the state of things in the Western and Central Caucasus. In the narrow valleys terraces are seen 1500 to 2500 feet above the channels of the streams, to which they fall precipitously. A visit was paid to the glaciers of the Bogos group, after which the district was left by the Bashi-Kodor pass. The Daghestan mountains, which form, from a tectonic point of view, a strongly individualized unit in the Caucasus system, consist chiefly of cretaceous and jurassic strata, the latter suddenly giving place southwards to the tertiary of the Sabui hills. Large collections of plants and fossils were made, which await examination by experts, while M. de Déchy added largely to his fine series of photographs.

The Ancient Topography of Buner, North-West Frontier of India.—At the time of the operations in Buner of the Malakand Field Force, early in 1898, facilities were offered to Dr. Stein, principal of the Oriental College at Lahore, to carry out an examination of the archæological remains of the district, interesting as forming a portion of the ancient Udyana, but till then wholly inaccessible to students. The results of his tour are described by Dr. Stein in a brochure issued in 1898 at the Government press at Lahore. The first section of the paper is taken up with a personal narrative of the author's archæological surveys, with descriptions of the ruins examined. Of these, some of the most interesting are those which occupy a rocky spur above the Barandu river, near the village of

Sunigram.* The importance of the site is indicated by the massive construction of the walls which support the terraces and by other architectural features. Although the number of buildings now traceable at Panjkotai is not large, the ruins bear comparison in many ways with the well-known remains at Takht-i-Bahi and Jamalgarhi, the size of the structures still above ground being even more imposing. In the second part of the paper Dr. Stein attempts the identification of the sites examined with places spoken of by the Buddhist pilgrims Fa-hien, Hiuen-Thsang, etc., whose writings form practically the only authorities for the early history of the district. The identification first proposed by Vivien de St. Martin, and since confirmed beyond all doubt, of Mangali the ancient capital of Udyana, with Manglaur in Upper Swat, affords a firm basis on which to build conclusions; and Dr. Stein finds a striking correspondence between the three sacred spots mentioned in the Chinese accounts and the ruins examined at Panjkotai, Gumbatai, and Girarai, the first-named representing the great Mahavana monastery. Dr. Stein was unfortunately unable to visit Mount Mahaban, adjoining the Chamla valley, which he considers to have the best claim of all the suggested sites for identification with the *Aornos* of the historians of Alexander. Extensive remains have been lately reported to exist on the mountain.

The Morphology of the Tian Shan.—In the third number of the Berlin Geographical Society's *Zeitschrift* for 1899, Dr. Friederichsen concludes his memoir on the morphology of the Tian Shan, of which the first part was noticed in the *Journal* for October (vol. xiv. p. 443). The first section of the new instalment deals with the hypsometry of the range, the whole of the data at present available being arranged in tabular form, with statements of the source from which they are derived and the means of determination employed. At the close of each table dealing with one of the larger subdivisions of the Tian-Shan, the writer sums up briefly the hypsometrical conditions of such subdivision. The general characteristics of the whole range are summed up at the outset in the following two conclusions: (1) that, in passing from north to south, an increase in all the absolute measures of height is observable, and at the same time a decrease in the relative differences between the valley-floors and the neighbouring ridges; (2) that in the direction of the longitudinal axis the values diminish from the centre towards the east and west. The effect of these laws is observable in relation to the hydrography and valley systems, which form the subject of the next section of the paper. The streams of the Tian Shan may thus be divided into—(1) those which flow longitudinally in the direction of the axis of the chain, in accordance with the slope from the centre towards the east and west; (2) those which flow perpendicularly to the direction of the folds, under the influence of the slope towards the bounding steppes and deserts, or of that from the higher southern to the lower northern portions of the range. The longitudinal valleys are again divisible into two types. The first are of small absolute altitude, and the river-beds are cut directly into the original Palæozoic rocks; the second have their floors at a high level, but are bounded by relatively low walls, and the streams flow over recent masses of detritus. These recent deposits seem in some measure connected with a former abundance of lakes without outlet, a phenomenon which is of importance also for the explanation of the transverse valleys. Other sections of the paper, of which we can do little more than indicate the contents, treat of the geology and climatic conditions of the Tian Shan, the part played by the latter in the determination of the morphologic features being brought prominently forward. The chief climatic characteristic of

* This name is said by Dr. Stein to date back to a period preceding the Pathan occupation of the country.

the range is undoubtedly its "continental" nature, and the sharply pronounced cor trasts to which this is due exercise a preponderating influence on many phenomen connected with the external form of the range. Dr. Friederichsen's memoir mu long remain the groundwork of all researches relating to the Tian Shan.

The Federated Malay States.—The reports for the year 1898 on th Federated Malay States contain many matters of interest. Taken as a whole, th year was one of prosperity and progress. Tin-mining is still the principal industry and the price of this metal had greatly risen during the year. The trunk road which connects Pahang with the western seaboard, was completed during the yea This important work, among other things, has placed the capital of Pahang withi an easy two days' journey of Kuala Lumpur, and has opened up a large area o country, which until lately was practically inaccessible. Another road is in cours of construction between Tras, on the trunk road, and Bentong, 21 miles in length This road runs through a belt of uninhabited country, parallel to the main range of the peninsula, and will serve to open up a large area of stanniferous land Mr. Hugh Clifford, the British resident of Pahang, urges the necessity of a furthe construction of roads for the benefit of the state. The highest temperature recorded in the state of Pahang during 1898 is 93° Fahr. at Pekan in November; the lowest temperature being 62° Fahr., in Kuantan, while the mean temperature for the year was 78·6°. The seat of government of this state has been removed from Pekan to Kuala Lipis, 200 miles inland. In the state of Perak trigonometrical surveyors have been at work on the Perak river; progress has also been made during the year in railway extension and other public works; good work has also been done in the new Forest Department of this state. The 170 miles of railway extension that are required to give through traffic from the centre of Province Wellesley to Port Dickson, on the coast of Negri Sembilan, will take, it is expected, between five and six years to complete.

AFRICA.

Lake Kivu and the Albert Nyanza.—We have received the following interesting letter from Mr. Arthur H. Sharp, dated "Toro, Uganda, August 30, 1899:" "I have reached here a few days ago, as I hoped, *en route* for Khartum and Cairo, but, finding no communication open, and having little time for prospecting, I am reluctantly obliged to return home at once, leaving my great friend and comrade, E. S. Grogan, to proceed *viâ* Albert Nyanza to Wadelai, and thence by hook or crook down the Nile. Mr. Coles will probably remember us as unworthy pupils in 1897. We can claim to have travelled from Ujiji overland to Usumburu (north end of Tanganyika), thence by Rusisi valley carefully mapped to Lake Kivu; here we found a German savant, Dr. Kandt, who has devoted three years to Kivu. He has personally walked round Kivu—540 miles, I think—taking four observations per minute, and finding himself 230 yards out at the end, or something like that. So we cannot in any way forestall his work. Continuing thence by east coast of Kivu to the north end, we reached the volcanoes. I spent three or four weeks exploring that country; thence to south end of Albert Edward Nyanza, most times in countries unexplored by Europeans; thence by east coast of Albert Edward Nyanza into Toro. We have found Lake Kivu entirely incorrect, and our observations tally with Dr. Kandt's, but, for reasons aforesaid, we can't publish our maps. The east coast of Albert Edward Nyanza is quite incorrect in our maps, and that I can show, no other white man having even mapped out that side. We have collected as many curios as possible on this route, including a dozen or so Batwa (dwarf) bows and arrows, according to Dr. Kandt, very scarce in Europe. We also came into contact with Congo cannibals, four of whom were left in Mr. Grogan's

hands; the rest had fled. Most unfortunately, one only has survived, and him I hope to get home."

Activity of the Egyptian Public Works Department in 1898.—The recently issued report by Sir William Garstin records a large amount of valuable work performed during 1898 in the various branches controlled by the Ministry of Public Works. Irrigation naturally takes the first place, and under this head good progress is reported, both with regard to works already on hand and to the inauguration of new improvements. The rise of the Nile took place late in 1898, and though eventually no great deficiency, such as has occurred in 1899, was experienced, the need of further works in Lower Egypt to utilize the additional water-supply to be provided by the great dam at Assuan was clearly demonstrated. It is therefore proposed to construct a new barrage, costing something under £E.500,000, on the Damietta branch, so as to give an independent supply to Northern Gharbieh, which in bad years is especially liable to deficiency. New weirs are already under construction immediately below the main barrage, which has itself been strengthened by cement grouting. A report on the great Nile reservoir works by Mr. W. J. Wilson gives both a sketch of the history of the project and a description of the Assuan dam as projected, with other associated works. From a geographical point of view, the report on the newly formed Survey Department, which includes the geological and other surveys formerly under separate management, is of special interest. A considerable amount of triangulation was carried out in 1898 and the early part of the present year, both in the delta (especially Northern and Eastern Gharbieh) and in the Fayum. The operations are now being performed with greater accuracy than has hitherto been the case. The Geological Survey has also added a large area to that previously mapped. The oases of Baharia (Bahrieh), Farafra, Dakla, and Kharga have all been surveyed on the scale of 1 : 50,000, and large additions to geographical knowledge made. West of Farafra springs were found, and much-frequented caravan tracks leading to the oases of Siwa and Jarabub. Other areas surveyed include the Nile valley south of Cairo and from the First Cataract to Korosko; the neighbourhood of the Fayum; a part of the eastern desert adjoining the gulf of Suez and of the Sinai peninsula opposite; and in the north the oases of Moghara, west of the Wadi Natrun. Captain H. S. Lyons, the director-general of the Survey Department, urges the need of a reorganization of the triangulation section, and of a separate staff to commence the surveys of large towns.

Russian Explorations south of Abyssinia.—The tenth number of *Petermanns Mitteilungen* reproduces from the Russian *Invalid* the account of explorations lately carried out by a cavalry officer named Bulatovitch, in the mountainous region west of the Omo, only partially explored by Cecchi and other travellers, who reached Kaffa from the north. The Russian officer is said to have first reached this region in November, 1896, and to have made a more extended journey in 1898, thoroughly exploring the mountain range which forms the watershed between the Omo and Sobat basins, and to which he gave the name Czar Nicholas II. range. A sketch-map is also reproduced, on which routes, presumably those of Captain Bulatovitch, are inserted, together with the positions of points said to have been fixed by him astronomically. They occur, however, almost entirely along the summit ridge of the range, mostly at a distance from the routes inserted. The range is said to be highest in its northern part, where several peaks exceed 10,000 feet. The central portion is distant only 20 to 25 miles from the Omo, and rises to a height of 3000 to 5000 feet above the river. The range intercepts the clouds brought by the trade winds, and great quantities of rain fall, especially in the central portion. Towards the south the climate becomes dryer.

The fall is abrupt towards the east, but more gradual to the west. The range is said to bear no trace of volcanic origin, although it lies directly between districts known to consist of eruptive rocks. Iron and copper and probably other minerals occur. The Omo takes various names in different parts of its course, being known successively as Shorum and War before receiving the name Nianiam near its mouth. Below the junction of the Gibie and Gojeb, the principal tributaries from the west are the Gumi and Kibish. From the western side of the range the Baro, Mena, Kilu, Sibilima, and other streams, flow east towards the Sobat.

Exploration in Futa Jallon.—A journey of some importance has lately been made through the less-known districts of Futa Jallon by a French colonial surgeon, Dr. Maclaud. A preliminary report on the journey appears in the September number of the *Bulletin du Comité de l'Afrique Française*, which body bore part of the expenses. A sketch-map of Dr. Maclaud's routes, originally published by the "Service Géographique des Colonies," is reproduced. Former explorers in Futa Jallon have, as a rule, kept to the main trade routes, but Dr. Maclaud traversed the country and neighbouring districts in all directions, from Timbo as a centre, so that he has added much to our knowledge. He travelled almost without escort, relying for success on the confidence inspired by his intimate knowledge of the natives and their languages. Owing to the French occupation and the political rivalry between the native factions, Timbo has of late years become almost a desert, though the extensive groves of orange trees mark the position of former habitations. The natives of Futa Jallon are by no means, Dr. Maclaud says, Peulhs of pure race, as was thought by Faidherbe; four distinct castes, corresponding to four invasions, being recognizable. Dr. Maclaud's excursions around Timbo have shed light on the hydrography of the various streams which diverge in all directions from the central *massif*, including the Tinkisso (Niger basin), the Little Skarsies, the Bafing or Upper Senegal, the various headstreams of the Faleme and Gambia, and, lastly, the upper courses and branches of the Rio Grande, and other coast streams of Portuguese and French Guinea. The sources of the Little Skarsies, Tinkisso, and of a tributary of the Bafing all lie in Mount Bundu-Aere, west of Timbo, within a radius of less than 2 miles. The Tene, which was formerly considered the headstream of the Faleme, in reality joins the Bafing, which at the lowest point reached by Dr. Maclaud had a breadth of 250 yards. A line of hills, 2600 feet high, separates the valley of the Bafing from the basin of the Faleme, which is formed by the junction of four important head-streams traversing a broken and fertile country. Dr. Maclaud obtained much information respecting commercial routes, etc., and made considerable geological, botanical, and ethnological collections, the last including a series of Fula and Mandingo skulls. He also made many astronomical observations and determinations of altitude.

The Southern Districts of the Cameroons.—Within the last two or three years some progress has been made towards a better knowledge of the southern districts of the Cameroons, to which, until lately, less attention has been paid than to the more northern parts of the territory. For the upper basin of the Nyong, the journey of Kund and Tappenbeck in 1888 long remained practically the only source of information. In 1897 the government decided to create an important military post at the station of Lolodorf, on the upper Lokunje, and from this as a centre, surveys have been made of the surrounding country. The results have not yet been worked out, but meanwhile Baron von Stein, who was for two years in charge at Lolodorf, gives, in the *Mitteilungen aus den Deutschen Schutzgebieten* (1899, pt. 3), a general description of the province, the limits of which towards the south and east are still undefined. He has paid particular attention to the native tribes

and their numerous subdivisions, and appends a rough sketch-map showing their several habitats. The hydrography of the region is also roughly shown, but in a manner which it is quite impossible to reconcile with earlier maps, such as that of the northern Bulu country, based on the surveys of Lieut. Glisczinski and others, given in the first number of the same periodical for 1899. From the description of Baron von Stein, however, it seems that considerable modifications will be introduced into our maps when the results of his surveys are worked out. The district of which Lolodorf is the centre lies east of the strip of uninhabited primæval forest which stretches along the coast. Its western portion, as far as the Pfalla, a southern tributary of the Nyong, is a more or less hilly country covered likewise with dense forest, while further east the country is more level and open. The hilly districts—composed chiefly of granite, syenite, etc.—are exceedingly well watered, the soil (a thick layer of humus) never becoming parched even after a dry season of three to four months. The river-systems are those of the Lokunje, Nyong, and in the extreme south-east the Lobo or Jea (Ja), a tributary of the Sanga. The Lokunje is said to rise near the southern borders of the Cameroons. The upper Nyong is navigable for a long distance, but lower down the river is much obstructed by rapids. The forests abound in valuable timber, but at present rubber forms the only exploitable product. The supply yielded by Landolphias, and in some places by Kickxias, is likely to last a long time. The most primitive tribe is that of the Bagielli, or Bekue (the dwarf tribe of Morgen), but this is likely before long to be absorbed by its neighbours. A section of the Bakoko, in the north, fall within the influence of the station, but the most important tribes are the Ngomba and various sections of the Pangwe (Mpongwe) family, the Bule being the most numerous. There are innumerable subdivisions, differing from each other both in language and customs.

Expedition in the Southern Interior of Angola.—It is stated in *Globus* (vol. 76, p. 246) that an expedition started in August from Mossamedes for the Kunene and Zambezi, under the leadership of the botanist Dr. Baum. The route sketched out is one leading from the Koroka to the Kunene near Humbe, and thence north-east and east to the Kubango. It is proposed to descend the last-named stream for some distance, and then strike across in about 16½° S. through an unexplored district to the Zambezi. The principal object of the expedition is to examine the agricultural and other capabilities of the country.

The Portuguese on the West African Coasts.*—By the publication, lately completed, of an English version of Azurara's famous Chronicle, the Hakluyt Society has placed in the hands of English readers the most authentic account which exists of the great discoveries carried out by the Portuguese under the auspices of Prince Henry the Navigator. The editorial work has been ably performed, and no pains have been spared in the endeavour to supply a complete elucidation of the text by notes and introductory matter bearing on the subject. The first volume contains an interesting sketch, by Mr. Prestage, of the life and writings of Azurara, to whom the task of writing a chronicle of the great deeds of Prince Henry was entrusted by the prince's nephew, King Affonso the Fifth. The chronicler is said to have entered the order of Christ—in which he came in time to be commander—as a young man. Applying himself later to the study of letters, he first became known as an author in 1450, when his 'Chronicle of the

* 'The Chronicle of the Discovery and Conquest of Guinea,' by Gomes Eannes de Azurara. Now first done into English by C. R. Beazeley and Edgar Prestage. London: Printed for the Hakluyt Society, vol. i., 1896; vol. ii., 1899.

Siege and Capture of Ceuta' saw the light. He seems to have then held a post in the royal library, of which he was custodian in 1452, finishing his 'Chronica de Guiné' there in the following year. The chronicle, of which two early manuscripts exist, was first printed at Paris in 1841, with an introduction and notes by the Visconde de Santarem. It in reality constitutes a memoir of the life and work of Prince Henry, whose ancestry and early life it describes, and who is throughout the central figure. The history ends, however, with the year 1448, the author's intention of writing a second part dealing with the final portion of the prince's work having never, unfortunately, been carried out. In the second volume Mr. Beazley contributes a useful sketch of the early history of African exploration, supplying details not given by Azurara, and treating of a variety of questions concerned with the geographical knowledge of the time. His notes on the early knowledge of the West African islands, and on African cartography down to the death of Prince Henry, form perhaps the most valuable sections. Reproductions of portions of early maps are given, including the Laurentian or Medicean Portolano of 1351, the Catalan map (1375), Andrea Bianco's of 1436 and 1448, and Fra Mauro's of 1457–59. With regard to Fra Mauro's map, the portion given is not of great value apart from the remainder of the continent, and it is to be regretted that a sketch at least of the whole of Africa, as shown by that cartographer, was not supplied. Mr. Beazley's interpretation of the map is at least open to question. He considers that the portion marked "Diab" represents the southern extremity of the continent, and thus credits Fra Mauro with a knowledge of its approximate length from north to south, whereas many considerations point in the direction of a much more restricted knowledge.*

The Fipa Plateau and Rukwa Plain.—The region east of the southern part of Lake Tanganyika has been traversed of late years by a number of travellers, and its geography may be said now to be fairly well known. A journey made in 1897 by Mgr. Lechaptois, vicar-apostolic of the Tanganyika Mission of the White Fathers, across the Fipa plateau and a portion of the Rukwa plain, helped among others to extend our knowledge, and is briefly described by Dr. Langhans in the tenth number of *Petermanns Mitteilungen* for the present year. Mgr. Lechaptois made a survey of his routes, and this, as well as the work of other travellers, is utilized by Dr. Langhans for the construction of a large-scale map of the district, which accompanies the article. The traveller, who had already visited the northern part of the Fipa plateau in 1893, traversed its whole extent in 1897 during a journey from Kala, the mission station on Lake Tanganyika, to Karambi, in the Awemba country, for the consecration of the vicar-apostolic of the Nyasa Mission. He describes the plateau as bare and sterile, though further north it struck Captain Ramsay as very fertile. On the return journey Mgr. Lechaptois took a more easterly route across the Saisi valley, where he found the vegetation much more

* Almost all the interior names which can be recognized in the south eastern half of the continent belong to Abyssinia and Shoa, of which Fra Mauro shows a much better knowledge than his contemporaries, except in so far as he pushes them far too much to the south—almost to the southern verge of the continent as represented by him. Thus Mount Zuquala, in Shoa, appears, with other features in correct relation, in the portion of the map reproduced by Mr Beazley as "South Africa." The "Cavo de Diab," which he considers to represent the southern point of Africa, occurs in connection with the fabulous islands of men and women placed by Polo between Persia and Africa, and by Conti near Sokotra. Sofala, again, occurs near Diab, north of Brava and Mombasa. Surely also "Garbin," which is considered a place on the west coast reached from Sofala, is nothing more than the Italian for "south-west."

luxuriant than in the valleys which run down to Tanganyika. The descent to the Rukwa plain, by the escarpment of the Shingamba range, proved very difficult. From above the plain had the appearance of a sea of vapour, and the climatic contrast experienced after making the descent was as great as that described by Ramsay (cf. *Journal*, vol. xiii. p. 72). The foot of the escarpment was now skirted in a northerly direction, the route here diverging but little from those of Wallace and Ramsay, though followed in the opposite direction. The ascent to the plateau was made a little west of the mission station of Rukwa. The lake, in its present restricted dimensions, was not visited, and the map in this section is chiefly based upon Mr. Wallace's survey. The routes of other visitors to its shores —Kerr-Cross, Wissmann, Nutt, and Ramsay—are, however, inserted, though that of Herr von Elpons, who is said to have reached the lake in 1897, is not shown. Dr. Langhans gives a note on the somewhat confused nomenclature of the Fipa country.

The Geodetic Survey of South Africa.—The report of the astronomer at the Cape of Good Hope for 1898 contains some information on the progress hitherto made with the geodetic survey of Rhodesia, first determined on at Mr. Gill's suggestion early in 1897. Field operations were resumed in May, 1898, after the close of the rainy season, the difference of longitude between Buluwayo and the Cape observatory being first determined by exchange of telegraphic signals, while astronomical latitude and azimuth were also determined at Buluwayo. A base-line of 11¾ miles was then measured backwards and forwards with the Jäderin apparatus, which was carefully compared with the Cape standards before and after. Theodolite work was also carried out at seventeen stations, at seven of which the astronomical latitude was determined. During the succeeding rainy season it was found that work could be carried on with advantage in the intervals between the rains. Field work for the delimitation of the boundary between Bechuanaland and German South-West Africa was commencced in November, 1898, by the commissioners of the two nations, Major Laffan and Lieut. Wettstein, both of whom had previously practised observations at the Cape observatory. As regards geodetic work in Africa as a whole, it is pointed out that the surveys now in operation or contemplated justify the expectation that arcs extending through the greater part of the length of the continent may be completed in the near future. Triangulation has already been set on foot to fill in the 140 miles still wanting to complete the chain from Cape Agulhas to Rietfontein; while by the agreement with Germany the demarcation of the boundary will be carried to about 21° 50′, and possibly further. It is also proposed before long to carry an arc of the meridian from the south of Rhodesia to Lake Tanganyika, while a hope is expressed that the German Government may continue the work to Uganda. Thence the way is now clear for a triangulation along the Nile to Alexandria, practically along the same meridian of 30° E. In recording the results, already published in the *Journal*, of the recent telegraphic determination of the longitude of Nkata bay on Lake Nyasa, Mr. Gill says that this has shown the previously accepted longitude was about 6 miles in error. This is not quite intelligible, for, as was pointed out by Captain Boileau in the paper read before the Society in April last, the new value is practically identical with that given in the map compiled from the observations of Lieuts. Rhoades and Phillips, and published last year in the *Journal*. Even the survey of Mr. James Stewart, published in 1883, gives a position differing by only about 3′ from that now fixed. The longitude of Umtali has also been fixed by signals exchanged with Captain Watherstone of the Anglo-Portuguese delimitation commission, the result obtained being 2h. 10m. 41·2s. E., or 32° 40′ 18″.

AMERICA.

The Geographic Board of Canada.—By an Order in Council of the Governor-General, dated December 18, 1897, a "Geographic Board" for Canada was constituted for the purpose of dealing, like the similar body in the United States, with the question of geographical nomenclature. The first annual report of the board, which has lately been issued, gives a sketch of the origin and history of that body, with a statement of the first results of its activity. As far back as 1889–90 endeavours were made to introduce a uniform system, based, as regards orthography, on the rules of our Society, into the various Government publications. In 1891, a list of over 1300 names relating to the north-west was drawn up, but the voluntary nature of the efforts deprived them of the authority necessary for success, so that little was effected until, partly owing to the action of the United States Board, the matter was taken up by Government, with the result above stated. A series of rules has already been drawn up by the board, of which the tenor of the most important is as follows: Especial weight is to be attached to priority, appropriateness, and euphony, especially the first, in the selection of names, and in the case of corruption the original forms are, as a rule, to be restored. The possessive form is to be avoided where possible, and when retained the apostrophe is to be dropped. Hyphens are not to be used between the parts of Indian names. The form "canyon" is to be used instead of "cañon," and "brook" is considered preferable to "creek" in describing small streams. The use of alternative names is to be discontinued where possible. As regards orthography, the Society's rules are adopted, but French names are to be spelt according to the rules of the French language. A list of decisions arrived at by the board is printed in the present report. The greater number refer to questions of variable spellings or duplicate names in common use, no attempt having been made to restore native names in cases where English names have been generally adopted, though the former are of course retained where possible. The following examples may be of interest: "Dawson" replaces "Dawson City" (the use of "city" or "town" as parts of names being deprecated), and Laberge the corrupted form Lebarge. Klondike is of course retained in place of Throndiuck, and Lewes (not Lewis) is used for the western headstream of the Yukon. "Browns creek" is adopted in indication that the distinguishing word is not an adjective, but the possessive form is dropped in the case of Arthur's seat. It may be doubted whether the last is well-judged, as the case stands apart from the ordinary use of the possessive in geographical names.

The Dune Floras of Lake Michigan.—An instructive study of the dune floras of Lake Michigan has recently been contributed by Henry Chandler Cowles, of the Hull Botanical Laboratory, to the *Botanical Gazette* published at Chicago (1899, Nos. 2–5). The subject is considered from the point of view of a practically new science, which has received the name of ecology, and is concerned with the mutual relations of plants and their environment, its object being to throw light on the modifications of plant-structure actually in progress as a result of changing conditions, and ultimately on the origin of plant-structures themselves. With the latter geography is of course not concerned, whereas the early stages of the inquiry, which are necessarily devoted to the investigation of the plant-formations of various localities, and the facts and laws of the distribution of characteristic species, are essentially geographic, and are the special subject of the paper now under review, the continuation of the study being reserved for a future paper. The dunes in question occur chiefly on the eastern and southern shores of Lake Michigan, being due to the action of the prevalent south-west and north-west winds. They attain their maximum development in the Dune Park region in the extreme south, active

dunes extending here as far as a mile inland, whereas elsewhere they are confined to a narrow belt fringing the shore. They are formed principally at the mouths of rivers, which on the Michigan coast tend in consequence to form small lakes near their mouths; but they are also conspicuous on projecting points of land, and even on high bluffs. The factors of most importance in determining the distribution of plants in the various dune associations are (1) light and heat; (2) wind; (3) soil; (4) water, *i.e.* the absence of a constant supply. These produce a composite effect on the vegetation, which shows both xerophytic and arctic structures. The writer considers the "plant societies" (*i.e.* groups of planes living together in common habitats and subjected to similar life conditions) represented in the Michigan dune region in the order of their development, beginning with the beach—the normal primitive formation—and passing in turn through the stationary beach dunes, the active or wandering dunes, and the arrested or transitional dunes, to the passive or established dunes, which constitute the majority in the region in question. Under these heads he deals with such phenomena as the formation of the dunes by the growth of plants, showing the species most fitted to lead to this result; the wandering of dunes as the conditions become too severe for the dune-forming plants; the encroachment of dunes on pre-existing floras and its results; and, lastly, the development of new floras, different on the windward or leeward slopes, as the rate of motion of the dunes becomes checked. Vegetation gets its first foothold at the base of lee-slopes about the outer margin of a dune complex, because of soil moisture and protection from wind. On the captured lee-slopes *Tilia Americana* rapidly forms forests, while on the windward slopes evergreens predominate. Oaks occur on inland dunes and southern slopes, and may follow pines when the shelter from cold winds becomes sufficient. As a contribution to the study of dunes generally the paper is of much value, by reason of the influence which the vegetation is shown to have in modifying the topography. A series of excellent photographs illustrates the various phenomena.

"Bureau Démographique" at Buenos Aires.—We have received a circular announcing the establishment, by decree of March 22, 1899, of a "Bureau Démographique" at Buenos Aires, charged in the first instance with the distribution of the results of the latest census of the republic, and, generally, with the publication, in a well-digested form, of all information obtainable relating to the movement of population and kindred phenomena in Argentina. It is proposed for this object to issue a bulletin, which will at first appear at irregular intervals, according as material is available, but subsequently, it is hoped, at three-monthly or even monthly intervals. The bulletin will be issued to all institutions which may agree to an exchange of publications, and, in addition, to all functionaries and institutions specially interested in the subjects dealt with.

Western Oaxaca.—At the Dover meeting of the British Association, Mr. O. H. Howarth described a journey in Western Oaxaca, Mexico. He said that the exploration of a portion of the state of Oaxaca, lying south and west between the capital city and the sea, became necessary in the latter part of last year, with a view to ascertain a possible route between the valley of Rio Minas, on the upper course of the Peñoles river, and a point on the Southern railway, without traversing the high mountain ridges extending between that valley and the city, on a direct line. The whole region is mountainous, being an expansion of the parallel main ranges of the Western Sierra Madre continued through the States of Guerrero and Oaxaca as far south as the Isthmus of Tehuantepec. The ridges, though approximately parallel, are of somewhat irregular conformation. They rise generally to an altitude of between 8000 and 9000 feet, being intersected by valleys of generally greater breadth than the cañons of the same range further north; these valleys, however,

descending to levels of from 3000 to 4000 feet, and of course to still lower elevations as the ranges approach the Pacific coast. The ranges are largely covered with varied foliage, and the prospect from any of the high ridges is of great magnificence. On leaving the city of Oaxaca in a westerly direction, an open rolling country, partly bare of vegetation, is traversed for a distance of 9 or 10 miles to the foot-hills of the nearest range, crossing the river Atoyac close to the city. A prominent object in the centre of this tract is the white dome of the unfinished monastery of Cuilaps, a remarkable structure of high architectural interest raised by Cortez during his occupation of the country, and said to have also comprised a residence for the Princess Malintzi or Malinche. The evidence of this is, however, doubtful, and may possibly have been based on the existence in one of the transepts of a massive inscribed gravestone on which the name of Cortez appears. Entering the range by the winding cañon of Zavaleta, a gradual ascent is made to a summit clothed with pine forests, where natural ice is prepared and stored on a singular native system. The trail issues above the little mountain village of San Pablo Cuatro Venados, or St. Paul of the Four Deer, one of the most remarkable sites of early settlement in Mexico. Following the ridge, another descent commences through a heavily timbered cañon to the mining village of San Miguel Peras, some 15 miles further. A mile beyond this is the meeting of two forks of the Rio Verde, and the usual uncertain nomenclature as to rivers and other local features is encountered. A second ascent to 9000 feet has then to be accomplished by exceedingly rough trails, succeeded by a descent into a valley of less depth, but falling gradually to the north and south of the point of crossing. On reascending from this, a summit is reached crowned by a native village known as Huitepec, occupied by a population of Indians whose language proved to be entirely distinct from any of the known dialects of the state, and apparently isolated. It possesses several peculiarities, and seems to be a solitary survival of one of the most ancient tongues of Central America. Immediately beyond this the geological formation changes suddenly, the next descent being entirely covered with vast irregular boulders of grey limestone, amongst which the threading of a trail with horses and pack-mules is a matter of extreme difficulty. Again a high ridge has to be traversed at an altitude equal to the previous ones, amongst alternations of pine and scrub-oak growth and open spaces of a long fine grass, with a variety of flowering plants. At some 6 or 7 miles beyond Huitepec the trail enters the head of an extremely steep cañon, the side of which it skirts with an available width of sometimes not more than a foot or 18 inches, this track being known as the Infiernillo, or "Little Infernal," a name which the traveller by it considers by no means inappropriate, especially in the season of rains, when the clayey surface becomes slippery with moisture. Finally, the trail leads out upon a fourth ridge, overlooking the attractive valley of Rio Minas, with its winding river, a last descent being now made to a level of 4200 feet. The few inhabitants of this country, a delightful one both in climate and fertility, are of a simple and hospitable disposition, and engaged, so far as they follow any pursuit at all, entirely in agricultural occupations, though surrounded by rich mineral formations. The general absence of animal life is noticeable, though the valleys abound with butterflies and other insects. Poisonous insects of all kinds, and also snakes, appear to be very rare; in fact, almost unknown. The difficulty of access from the well-populated valley of Oaxaca has no doubt contributed to the isolation of a district so inviting. Further down the course of the Peñoles river, where it issues westward, the valley divides to the north-west and south-east, and, without any great change of elevation in the former direction, trends towards the district capital of Nochistlan at a distance of about 35 miles,

and thence in an easterly course towards the line of the Southern railway at Parian, some 30 miles north of the city of Oaxaca. This latter approach has a good road, which, prior to the existence of the railway, would merely have led into the mountains again. It may be expected, however, that, slow as the Mexicans are to recognize or avail themselves of any advantages of communication, the better access from the north to these productive valleys may gradually lead to their occupation and development, when further explored under European auspices. The climatic conditions are similar to those of all the southern interior of Mexico, though, owing to the intersection of the country by long and lofty ridges, the rainfall during the wet season is somewhat greater. The journey here described was undertaken during the month of December last, when the atmospheric conditions are perhaps unrivalled in the world as to temperature and salubrity.

GENERAL.

A Health Exhibition for Travellers.—Under the auspices of Livingstone College—an excellent institution to which reference has already been made in our pages—and with the support of the Royal Geographical Society, an exhibition is to be held at the beginning of January which should prove of much interest and assistance to intending travellers, particularly those proceeding to tropical countries. The object of the Livingstone Exhibition—such is its official title—is the promotion of the health and comfort of travellers or residents in foreign countries by the display of such articles of outfit as are recommended by the best authorities as conducive to hygiene abroad. The provisional programme has been sent to us by Sir George Taubman-Goldie, who has consented to act as president, and who urges the importance of the objects the promoters have in view. The exhibition, which will be held in the St. Martin's Town Hall, will be open to the public from Monday, January 1, to Friday, January 5, inclusive, but exhibits must be delivered on Saturday, December 30. The chief promoter of the undertaking is Dr. C. F. Harford-Battersby, of Livingstone College, whose medical knowledge and personal experience of life in the most unhealthy regions of Africa entitle him to speak with authority on all points relating to tropical hygiene. A special section will be devoted to the chief requisites of explorers, while articles of outfit actually used by travellers will be another interesting exhibit. Points of importance to permanent residents abroad, such as house-building and sanitation, will also be illustrated. Apart from conversaziones of general interest, the evening programme includes demonstrations by the London School of Tropical Medicine. A catalogue will be issued, which may, it is hoped, be of permanent use as a guide to outfit.

The Methods of Military Geography.*—In a recently published brochure, Prof. O. Barré presents an introduction to the study of Central Europe, as an indication of the methods which he thinks should be adopted by those who devote their attention to military geography. His aim is, in fact, to advocate the adoption by military geographers of modern scientific methods as opposed to the purely literary and descriptive side of the study which until lately found favour. In the introduction he gives instances of the erroneous conceptions prevalent owing to the want of study of the "Wherefore" of Physical features, and insists that a knowledge of at least the conclusions of geologists is quite within the range of the necessary qualifications of an officer. Prof. Barré then proceeds to sketch the broad principles of the science of geomorphology, treating in turn of the nature of the materials of the soil, their architectural arrangement, and the sculpture superimposed on this architecture by external agents. The author next applies these

* 'La Géographie Militaire et les Nouvelles Méthods Géographiques.' Par O. Barré. Paris: Berget Levrault et Cie. 1899.

principles to an examination of the geographical evolution of Central Europe, through the four great epochs of geological time. The subject is clearly and concisely dealt with, and though presenting, strictly speaking, no novelty of treatment the paper is useful as showing the interest which attaches to the study of physica geography taken up on scientific lines.

Ibn Batuta's Travels in Urdu.—We have received a first instalment of a translation into Urdu, in the vernacular character, of Ibn Batuta's travels in th East, by Maulvi Muhammad Husain, District Judge at Firozpur. The new ver sion is, of course, mainly intended for oriental readers, the translator's chief motiv being to lay before his Mohammedan fellow-countrymen "an example of untirin energy and unparalleled enterprise" on the part of one of their own faith. He ha therefore, taken up first, as more nearly concerning his prospective readers, th second section of the work, which deals with Ibn Batuta's travels in India, Ceylon and neighbouring countries. The original Arabic text of Ibn Jazzi of Granada from which the present version has been made, has never been translated int English in full, Dr. Lee having had access only to an abstract; though it wa used by the French editors, MM. Defrémery and Sanguinetti. Maulvi Muhamma has been at much pains to elucidate the text by identification of places and his torical notes, the chief points thus dealt with being summarized in the Englis introduction. He there calls attention to Ibn Batuta's account of the great famin which prevailed in India during the time of his visit, as showing to what a extent the sufferings from such calamities are mitigated in our own day. Th writer's personal knowledge of the country should make the explanatory matter o value to such students as are able to read Urdu in the original character.

Educational Map Slides.—Mr. B. B. Dickinson, M.A., and Mr. A. W Andrews, M.A., have for some time past given their attention to the production o a series of lantern map slides suitable for educational purposes. As the result o their labours, teachers and lecturers, instead of having to carry about with them large unwieldy maps, can now obtain a perfect series of political, physical, and commercial map slides in the compass of a small box. These slides have been prepared with great care; the price is two shillings each. They contain quite sufficient detail for lecture and educational purposes, and there can be no question as to the advantage they have, owing to their portable form, over the maps which have heretofore been in general use.

Death of Dr. Georg Kolb.—We regret to record the death of the young German traveller, Dr. Georg Kolb, well known for his journey to Mount Kenya and ascent to the foot of the final pinnacle of the mountain, in 1894–96. Dr. Kolb had lately returned to East Africa with the object of exploring the country east of Lake Rudolf. He had reached the shores of the lake, but there met his death from the attack of a rhinoceros. Details as to the previous results of his journey are not yet known.

CORRESPONDENCE.

On the Advance and Retreat of Sea-ending Glaciers.

In Mr. Klotz's very interesting "Notes on Glaciers of South-east Alaska," printed in the November number of the *Geographical Journal*, no explanation is suggested for the remarkable concurrent advance of the Brady glacier and retreat of the neighbouring glaciers that in Vancouver's time filled Glacier bay; the advance of the one being 5 miles, the simultaneous retreat of the others 45 miles. An

examination of the map shows that these phenomena confirm the observations on sea-ending glaciers recorded by me in my books on Spitsbergen and others since made in Tierra del Fuego, but not yet published. Though no soundings are given, the text implies that Glacier bay is relatively deep, whilst the head of Taylor bay was shallow. A moraine-bearing glacier ending in a shallow bay tips its moraine over its snout, and so, by raising the floor of the bay, forms a bottom on which it advances; this advance is continued until the glacier-front is cut off from the water by a belt of moraine. In a deep bay, where the glacier front ends in deep water and is not aground, no such advance is provoked. The Brady glacier, as the photograph on p. 533 shows, brings down a good deal of moraine. In its more vigorous days, no doubt the supply of ice brought down by it would have carried it far south of its then ice-front if there had been ground at sea-level for it to travel on; but there was not, so the ice broke off and floated away, dropping moraine into the water. As the water was filled up, the ice advanced over the moraine, and this it would do even though the supply of ice diminished, provided that the diminution did not reach the critical point where the glacier would be forced to retreat even from a dry bed at sea-level. When, by filling up the bay before it, the glacier had reached forward to the full length which the supply of ice brought down by it could stretch to on a dry bed (or rather a bed but little below sea-level), a terminal moraine would be formed around the snout, and this moraine would ultimately rise above sea-level; but the glacier streams would continually wash it about and rearrange its materials, turning it into and extending it as a riverine delta, such as the photograph shows. These changes might all go on at a time when the supply of ice was diminishing, and when, consequently, neighbouring glaciers ending in deeper water were rapidly retreating.

MARTIN CONWAY.

Patagonia.

In the discussion which followed the reading of Don Francisco Moreno's very valuable and interesting paper on Patagonia, it was suggested the name is derived from the Quichua *Pata*, "a terrace," and *cerna*, the plural particle, meaning "the land of terraces." The Spanish discoverers, however, called the land "Tierra de los Patagones," on account of the huge Indians there, and their immense feet (*patas*). Patagon means a man with big feet, just as Oregon means a man with big ears, alluding to that physical peculiarity of the natives found in Oregon. Similarly, Narigon means a man with a big nose.

A. M. ROBINSON.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1899–1900.

First Ordinary Meeting, November 13, 1899.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*G. T. M. Bridges (Lieut. R.H.A.); Henry Hope Buswell; Major W. J. Bythell, R.E.; Captain J. Walter Maxwell Carroll (Queensland Artillery); Thomas William Dampier-Bide; Albert Thomas Frampton; William Gordon, M.D.; Rev. Henry W. Hutchinson; Isaac S. McDougall; Dixon Provand; Major A. R. Stuart, R.A.; Hon. A. H. Hanbury Tracy; Captain Clifton Vincent Reynolds Wright (South Wales Borderers).*

The Papers read were:—

"Opening Address." By the President. "Travels in Bokhara." By Willy Rickmer Rickmers."

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full :—

A. = Academy, Academie, Akademie.	Mag. = Magazine.
Abh. = Abhandlungen.	Mem. = Memoirs, Mémoires.
Ann. = Annals, Annales, Annalen.	Met. = Meteorological.
B. = Bulletin, Bollettino, Boletim.	P. = Proceedings.
Com. = Commerce.	R. = Royal.
C. Rd. = Comptes Rendus.	Rev. = Review, Revue.
Erdk. = Erdkunde.	S. = Society, Société, Selskab.
G. = Geography, Geographie, Geografia.	Sitzb. = Sitzungsbericht.
Ges. = Gesellschaft.	T. = Transactions.
I. = Institute, Institution.	V. = Verein.
Iz. = Izvestiya.	Verh. = Verhandlungen.
J. = Journal.	W. = Wissenschaft, and compounds.
k. u. k. = kaiserlich und königlich.	Z. = Zeitschrift.
M. = Mitteilungen.	Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE

Alps. **Baedeker.**
The Eastern Alps, including the Bavarian Highlands, Tyrol, Salzburg, Upper and Lower Austria, Styria, Carinthia, and Carniola. Handbook for Travellers by Karl Baedeker. Ninth Edition. Leipsic: K. Baedeker; London: Dulau & Co., 1899. Size 6½ × 4½, pp. xxvi. and 568. *Maps, Plans, and Panoramas. Price* 10*s.* Two copies, *one presented by the Editor, the other by Messrs. Dulau & Co.*

Alps. *Petermanns M.* **45** (1899): 204–214. **Diener.**
Grundlinien der Struktur der Ostalpen. Von Prof. Dr. C. Diener. *With Map.*

Alps—Flora. *Natural Sci.* **15** (1899): 109–113. **Bennett.**
The Flora of the Alps. By Prof. Alfred W. Bennett.

Austria—Bohemia. *Petermanns M.* **45** (1899): 73–82, 113–123, 155–165. **Langhans.**
Die deutsch-tschechische Sprachgrenze in Nordböhmen. Von Paul Langhans. *With Maps.*

Baltic Islands. *Q. J. Geol. S.* **55** (1899): 305–326. **Bonney and Hill.**
Relations of the Chalk and Drift in Möen and Rügen. By Prof. T. G. Bonney, D.Sc., and the Rev. Edwin Hill. *With Sections.*

Prof. Bonney brings forward a new theory to explain the remarkable relations between the chalk and the boulder clays of the islands in the western Baltic.

Baltic Sea. **Rein.**
Die physikalischen und biologischen Eigentümlichkeiten der Ostsee, von Prof. Rein. (Separat-Abdruck aus den Sitzungsberichten der Niederrhein. Gesellschaft für Natur- u. Heilkunde zu Bonn 1899.) Size 8½ × 5½, pp. 4. *Presented by the Author.*

Belgium—Canals. *P.I. Civil Engineers* **136** (1899): 282–306. **Vernon-Harcourt.**
The Brussels International Congress on Navigation of 1898, the Bruges Ship Canal; and New Works at Ostend and Antwerp. By L. F. Vernon-Harcourt. *With Plates.*

Channel Islands—Jersey. *Quarterly J.R. Meteorolog. S.* **25** (1899): 203–206. **Yorke.**
Climate of Jersey. By the Rev. H. W. Yorke.

Denmark—Bornholm. *Deutsche Rundschau G.* **21** (1899): 343–346. **Gebeschus.**
Bilder von Bornholm. Von J. Gebeschus. *With Illustrations.*

France—Provence. *Blackwood's Mag.* **166** (1899): 407–416. **Lynch.**
In Provence. By Hannah Lynch.

France—Southern. *B.S.G. Lille* **32** (1899): 153–161. **Descamps.**
Villages Arabes en France. Par M. Auguste Descamps.

The paper gives an account of the Arab colonists who settled in France after the battle of Poitiers, when the Arab invasion was checked by the victory of Charles the Hammer, and of the Moorish refugees who sought shelter in France when driven out of Spain in 1610. Both of these have left clearly recognizable traces in the districts which they inhabited.

Germany—Prussia. *Meteorolog. Z.*, 16 (1899): 310–312. **Polis.**
Ergebnisse der Temperaturbeobachtungen zu Aachen 1838–1897. Von Dr. P. Polis.

Germany—Prussia. ———
Die Stadt Berlin, Festschrift der Stadtgemeinde, für die Teilnehmer am vii. Internationalen Geographen-Kongress, Berlin, 1899. Size $6\frac{1}{2} \times 4\frac{1}{2}$, pp. x. and 372. *Illustrations. Presented by Dr. J. Scott Keltie.*

Germany—Prussia. **Baedeker.**
Berlin und Umgebungen. Handbuch für Reisende von K. Baedeker. Zehnte Auflage. Leipzig: Karl Baedeker, 1898. Size $6\frac{1}{2} \times 4\frac{1}{2}$, pp. x. and 218. *Maps and Plans. Price 3m. Presented by Messrs. Dulau & Co.*

Germany—Prussia. **Polis.**
Die Niederschlagsverhältnisse der Mittleren Rheinprovinz und der Nachbargebiete. Von Dr. P. Polis.—Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Zwölfter Band, Heft 1. Stuttgart: J. Engelhorn, 1899. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 96. *Maps.*

Holland. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **16** (1899): 277–292. **Sasse.**
Komen er "Franken" voor in Drente of "Kelten" (Broca)? Bijdrage tot de Ethnographie van Nederland. Door Dr. J. Sasse Azn.

Holland. *Tijds. K. Ned. Aard. Genoots. Amsterdam* **16** (1899): 293–306. **Winkel.**
Franken in Drenthe (?). Door Dr. J. te Winkel.

Holland—Zuyder Zee. *B.S.G. Lille* **32** (1899): 34–44. **Vermersch.**
Le Zuyderzée. Projets de desséchement. Par M. le Docteur Albert Vermersch. *With Maps.*

Hungary. *Jahrb. Ungar. Karpathen-V.* **26** (1899): 1–20. **Karoliny.**
Die Klamm im Grossen Sokol. Von Michael Karoliny. *With Plates.*

Iceland. *P. Yorkshire Geolog. and Polytechnic S.* **13** (1899): 449–454. **Fennell.**
Notes on some Physical Features in Iceland. By C. W. Fennell. *With Plate.*

Iceland. **Collingwood and Stefansson.**
A Pilgrimage to the Saga-Steads of Iceland. By W. G. Collingwood & Jón Stefánsson, PH.D. Ulverston: W. Holmes, 1899. Size $11\frac{1}{2} \times 9$, pp. x. and 188. *Map and Illustrations.*

The preface states: "This is a picture-book to illustrate the Sagas of Iceland. It is intended to supply the background of scenery which the ancient dramatic style takes for granted." The illustrations are sketches, some of them coloured, not photographs.

Italy. *Rev. Scientifique* **12** (1899): 33–40. **Nourse.**
Les pêcheries de la Vénétie. Par M. Thorndike Nourse. *With Illustrations.*

Mediterranean. ———
The Mediterranean Pilot. Vol. iii., comprising the Adriatic Sea, Ionian Islands, the Coasts of Albania and Greece to Cape Malea, with Cerigo Island. Also the Gulfs of Patras and Corinth. Third Edition. London: J. D. Potter, 1899. Size $9\frac{1}{2} \times 6$, pp. xxiv. and 510. *Index Charts. Price 4s. Presented by the Hydrographer, Admiralty.*

Mediterranean—Crete. ———
Turkey, No. 2 (1899). Report by Her Majesty's Commissioner in Crete on the Provisional British Administration of the Province of Candia. London: Eyre & Spottiswoode, 1899. Size $18\frac{1}{2} \times 8\frac{1}{2}$, pp. xii. *Price 2d.*

Mediterranean Malta. **Fremantle.**
Copy of a Despatch addressed to the Secretary of State for the Colonies by Sir Arthur Lyon Fremantle, late Governor of Malta, dated December 29, 1898, on the Political Condition of Malta; and of all recent Correspondence relative to the same. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. 42.

Correspondence relative to the opposition in Malta to the use of English in the law-courts on an equality with Italian.

North Europe—Heaths. *Mém. S. B. Antiquaires du Nord* (1898): 139–226. **Sarauw.**
Les bruyères préhistoriques des pays baltiques, d'après les observations faites dans des tumulus de l'époque païenne. Par Georg F. L. Sarauw, traduit par Eug. Beauvois. *With Map and Illustrations.*

Norway. **Lees.**
Peaks and Pines. Another Norway book. By J. A. Lees. London: Longmans & Co., 1899. Size 8 × 5½, pp. xii. and 378. *Illustrations. Price 6s. Presented by the Publishers.*

A very bright, popular sketch of a holiday trip in the wilder parts of Norway.

Rumania. **Lahovari.**
Marele Dicționar Geografic al Romîniei . . . de George Joan Lahovari. Vol. ii. Fasc. iva. Constanța—Cucului (Valea-). București: J. V. Socecu, 1899. Size 13 × 10, pp. 601–800.

Russia. *Travel* 4 (1899): 214–221. **Francis.**
Notes of a Tour in Russia. Down the Volga, across the Caucasus, Tiflis, and the Crimea. By the Rev. A. Francis. *With Illustrations.*

Russia—Libau. *J. R. United Service I.* 43 (1899): 890–899. ——
The Kaiser Alexander III. Harbour at Libau. *Résumé* of an article in the 'Mittheilungen aus dem Gebiete des Seewesens,' from the "Morskói Sbornik." *With Maps.*

Scandinavia—Glaciers. *B. Geolog. I. University Upsala* 4 (1898): 45–78. **Westman.**
Beobachtungen über die Gletscher von Sulitelma und Ålmajalos. Von J. Westman. *With Map and Illustrations.*

On the icefields and glaciers inland from Bodö, on both sides of the boundary between Norway and Sweden.

Scandinavia—Land-movements. **Geer.**
Om den Senkvartara Landhöjningen kring Bottniska Viken. Af Gerard de Geer.—Sveriges Geologiska Undersökning. Ser. C. No. 178. Stockholm: P. A. Norstedt & Söner, 1899. Size 9 × 6, pp. 28. *Map.*

On the rising or sinking of the coasts of the Gulf of Bothnia.

Sweden. **MacGregor.**
Trade of Stockholm and the Eastern Coast of Sweden for the year 1898. Foreign Office, Annual No. 2317, 1899. Size 10 × 6½, pp. 44. *Price 2½d.*

Sweden—Jemtland. **Högbom.**
Om Ragundadalens Geologi (Mit einem Résumé in Deutscher Sprache). Af A. G. Högbom.—Sveriges Geologiska Undersökning. Ser. C, No. 182. Stockholm: P. A. Norstedt & Söner, 1899. Size 9 × 6, pp. 124. *Maps and Illustrations.*

Sweden—Meteorology. *K. Svensk. Vet.-A. Handlingar* 31 (1898): 1–73. **Hamberg.**
La pression atmosphérique moyenne en Suède 1860–1895. Par H. E. Hamberg. *With Maps.*

The plates showing monthly mean isobars include the whole Scandinavian peninsula. The value represented is the monthly mean of observations at 8 a.m., 2 p.m., and 9 p.m. daily, reduced to 0° C. and sea-level.

Sweden—Nordmark. **Petersson.**
Geologisk Beskrifning öfver Nordmarks Grufvors Odalfält. Af Walfr. Petersson.—Sveriges Geologiska Undersökning. Ser. C, No. 162. Stockholm, 1896. Size 9 × 6, pp. 60. *Plates.*

Sweden—Norrland. ——
Praktiskt Geologiska Undersökningar inom Vesternorrlands län med Bidrag af Länets Hushållningssällskap utförda genom Sveriges Geologiska Undersökning. II. Berggrunden.—Sveriges Geologiska Undersökning. Ser. C, No. 177. Stockholm: P. A. Norstedt & Söner, 1899. Size 12½ × 10, pp. 60. *Maps. Presented by the Swedish Geological Survey.*

Sweden—Rödö. **Holmquist.**
Om Rödöområdets. Rapakivi och Gångbergarter. Mit einem Résumé in Deutscher Spache. Af P. J. Holmquist.—Sveriges Geologiska Undersökning. Ser. C, No. 181. Stockholm: P. A. Norstedt & Söner, 1899. Size 9 × 6, pp. 118. *Map and Plates.*

The geology of the island of Rödö and its surroundings.

Switzerland. **Baedeker.**
Switzerland and the Adjacent Portions of Italy, Savoy, and Tyrol. Handbook for Travellers by Karl Baedeker. Eighteenth Edition. Leipsic: R. Baedeker; London: Dulau & Co. 1899. Size 6½ × 4½, pp. xxxiv. and 512. *Maps, Plans, and Panoramas. Price 8s. Two copies, one presented by the Editor, the other by Messrs. Dulau & Co.*

Switzerland—Lac de Champex. *Alpine J.* 19 (1899): 514–548. **Yeld.**
The Lac de Champex. By the Editor.

Switzerland—Zermatt. **Whymper.**
The Valley of Zermatt and the Matterhorn. A Guide by Edward Whymper. Third edition. London: John Murray, 1899. Size 7½ × 5, pp. xiv. and 224. *Maps and Illustrations. Price 3s. Presented by the Author.*

United Kingdom. **Taylor.**
The British Isles through an Opera Glass. By Charles M. Taylor, Junr. Philadelphia: G. W. Jacobs & Co., 1899. Size 8 × 5½, pp. 320. *Illustrations. Presented by the Author.*

Notes of a rapid tour.

United Kingdom—Commercial Geography. **Herbertson.**
Commercial Geography of the British Isles. By A. J. Herbertson, PH.D. London and Edinburgh. W. & R. Chambers, 1899. Size 7 × 5, pp. 140. *Maps. Price 1s. Presented by the Publishers.*

This is a careful and accurate epitome of the Commercial Geography of the United Kingdom; it deals with the physical geography in relation to the resources of the country in minerals and agriculture. The distribution of manufacturing centres is studied, the railway and canal systems described, and a good account given of the imports and exports of the country as a whole.

United Kingdom—England. **Murray.**
A Handbook for Residents and Travellers in Wilts and Dorset. Fifth Edition. London: John Murray, 1899. Size 7 × 5, pp. xlviii., 712. *Maps and Plans. Price 6s. Presented by Mr. Murray.*

United Kingdom—England. **Peek.**
Rousdon Observatory, Devon. Vol. xv. Meteorological Observations for the year 1898, made under the superintendence of Sir Cuthbert E. Peek, Bart. London, 1899. Size 11 × 9, pp. 40. *Plate.*

United Kingdom—England. *J.R. Agricultural S.* 10 (1899): 429–485. **Whitehead.**
A Sketch of the Agriculture of Kent. By Charles Whitehead. *With Maps and Illustrations.*

United Kingdom—England. ———
Antient Southampton. Catalogue of Works of Art belonging to William Burrough Hill, Southampton, 1897. Size 9½ × 6, pp. 32. *Presented by W. B. Hill, Esq.*

Catalogue of a collection of pictures of Southampton and neighbourhood, including many of the ancient buildings.

United Kingdom—England. ———
London Topographical Society. Report of the Organizing Committee, submitted at the First Annual Meeting of the Society, . . . March 9, 1899. Size 8½ × 5½, pp. 16. Illustrated Topographical Record of London. First Series. Issued by the Organizing Committee of the London Topographical Society, 1898. Size 11½ × 9, pp. [52]. *Illustrations.*

Drawings, usually accompanied by plans and descriptive notes, of old portions of London which have been rebuilt or destroyed.

United Kingdom—England. **Baddeley.**
Thorough Guide Series. The Peak District of Derbyshire and neighbouring Counties. By M. J. B. Baddeley, B.A. Seventh Edition, Revised and enlarged. London: Dulau & Co., 1899. Size 6½ × 4½, pp. xvi., 16, and 158. *Maps. Price 3s. Presented by the Publishers.*

United Kingdom—England **Cole.**

P. Yorkshire Geolog. and Polytechnic S. 13 (1899): 400-401.

The Distribution of Moorlands in the East of Yorkshire, as explained by the Glacial History of the county. By Rev. E. Maule Cole.

The author points out that the moorlands of the vale of York occur mainly on the north side of the valley, an arrangement which he traces to the action of the glaciers of the Ice age in sweeping away the soil from the northern side of the valley and accumulating morainic matter on the southern.

United Kingdom—Rainfall. **Symons and Wallis.**

British Rainfall, 1898. On the Distribution of Rain over the British Isles during the year 1898, as observed at more than 3000 Stations in Great Britain and Ireland, with articles upon various branches of Rainfall work. Compiled by G. J. Symons, F.R.S., and H. Sowerby Wallis. London: E. Stanford, 1899. Size 9 × 6, pp. 68 and 252. *Maps and Illustrations. Price 10s. Presented by G. J. Symons, Esq.*

In addition to the usual statistics, this issue contains a chapter on self-recording rain-gauges, with illustrations of the chief patterns, notes on the fluctuation of rainfall for 175 consecutive years, an account, with map, of a remarkable rain-storm at Angerton, Northumberland, on September 7, 1898, and several other valuable articles.

ASIA.

Arabia. **Landberg.**

Die Südarabische Expedition der kaiserlichen Academie der Wissenschaften in Wien und das Vorgehen des Prof. Dr. David Heinr. Muller actenmässig dargestellt von Dr. C. Graf Landberg. München: H. Lukaschik, 1899. Size 8½ × 6, pp. xvi and 186. *Presented by the Publisher.*

Asia—Exploration. *Deutsche Rundschau G.* 21 (1899): 444-459. **Jüttner.**

Fortschritte der geographischen Forschungen und Reisen im Jahre 1898. 1. Asien. Von Dr. J. M. Juttner.

Asia—Land Routes. *J. R. United Service I.* 43 (1899): 985-1016. **Bell.**

The Highway of the Nations: i.e. The Turko-Persic-Indian Commercial Route between Europe and Asia, and the Considerations Influencing its Alignment. By Colonel Mark Bell, C.B. *With Map.*

On the various possible land-routes to India.

Asia—Railway project. *Nineteenth Century* 46 (1899): 481-492. **Moreing.**

An all-British Railway to China. By C. A. Moreing. *With Map.*

Advocates a railway from Egypt across the north of Arabia and the south of Persia to Karachi, and a continuation of the Indian railway system from Mandalay to the upper Yangtse, and down the Yangtse valley to Shanghai.

Ceylon. **Grinlinton.**

Administration Reports, 1898. Part ii. Scientific. Survey Department. Report of Mr. F. H. Grinlinton, Surveyor-General. Size 13½ × 8½, pp. 24. *Maps and Plate. Presented by the Author.*

Ceylon. **Leclercq.**

Note sur le plus ancien entrepôt de commerce. Par Jules Leclercq. (Extrait des *Bull. de l'Acad. roy. de Belgique*, 3^e sér., t. xxxvii., 2^e partie, No. 1, pp. 58-64, 1899.) Size 9 × 6. *Presented by the Author.*

The oldest entrepôt is Point de Galle.

Ceylon. *J. Ceylon Br. R. Asiatic S.* (1898) 15 (1899): 213-290. **Vos.**

Monumental Remains of the Dutch East India Company in Ceylon. By F. H. de Vos. *With Plates.*

China. *Fortnightly Rev.* 66 (1899): 448-463. **Gundry.**

The Yangtse Region. By R. C. Gundry.

China—Canton. **Mansfield.**

Trade of Canton for the Year 1898. Foreign Office, Annual No. 2324, 1899. Size 9½ × 6, pp. 12. *Price 1d.*

China—Che-kiang. *Questions Dipl. et Colon.* 8 (1899): 22-28. **Fauvel.**

La Province du Tche-Kiang (Chine). Par A. A. Fauvel.

On the resources of Chekiang and the probable political destiny of that state in the "partition of China."

China—Che-kiang. *L'Esplorazione Com.* 14 (1899): 267-292. **Pini.**

Il Ce-Kiang. Studio Geografico-economico del Dr. Mario Carli. Por E. Pini.

China—Chinkiang. **Scott.**
Trade of Chinkiang for the year 1898. Foreign Office, Annual No. 2325, 1899. Size 9½ × 6, pp. 16. *Price* 1*d.*

China—Hankow. **Warren.**
Trade of Hankow for the year 1898. Foreign Office, Annual No. 2303, 1899. Size 10 × 6½, pp. 10. *Price* 1*d.*

China—Nankin. **Gaillard.**
Variétés Sinologiques No. 16. Nankin d'alors et d'aujourd'hui. Plan de Nankin (Décembre 1898.) Par le P. Louis Gaillard, S. J. Chang-hai: Imp. de la Mission Catholique, 1899. Size 10 × 6½, pp. 4. *Plan. Presented by the Author.*

China—Shanghai. **Brenan.**
Trade of Shanghai for the year 1898. Foreign Office, Annual No. 2318, 1899. Size 10 × 6½, pp. 16. *Price* 1*d.*

China—Shantung. **Hesse-Wartegg.**
Schantung und Deutsch-China, von Kiautschou ins Heilige Land von China und vom Jangtsekiang nach Peking im Jahre 1898. Von Ernst von Hesse-Wartegg. Leipzig: J. J. Weber, 1898. Size 10½ × 7½, pp. vi. and 294. *Maps and Illustrations.*

Notes of a visit in 1898.

China—Trade. ———
China: Imperial Maritime Customs. I. Statistical Series, Nos. 3 and 4. Returns of Trade and Trade Reports for the year 1898. Part ii.—Reports and Statistics for each Port. With Report on Foreign Trade of China, and Index to Annual Trade Reports, 1893-97. Shanghai; London: P. T. King & Son, 1899. Size 11 × 9, pp. xiv. and 714. *Maps and Diagrams. Presented by the Inspector-General of Chinese Customs.*

Japan—Climate. *J.G. Tokyo G.S.* 11 (1899): 347-354. **Nakagawa.**
On the Climatological Division of the Japanese Islands. By Genzaburō Kakagawa. [In Japanese.]

Japan—Formosa. *J.G. Tokyo G.S.* 11 (1899): 264-274. **Ishii.**
Geological Exploration in Formosa. By Yamajiro Ishii. [In Japanese.]

Japan—Formosa. *J.G. Tokyo G.S.* 11 (1899): 179-193. **Ishii.**
Geography of Formosa on its Administration. By Yamajiro Ishii. [In Japanese.]

Japan—Formosa. *J.G. Tokyo G.S.* 11 (1899): 338-346, 428-433. **Torii.**
Aborigines of Southern Formosa. By Ryōzō Torii. [In Japanese.]

Japanese Race. *T. Asiatic S. Japan* **25** (1897): 1-31. **Dooman.**
The Origin of the Japanese Race. By the Rev. I. Dooman.

Malay Archipelago—Borneo. **Easton.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 16 (1899): 245-258.
Voorloopige mededeeling over de Geologie van het Stroomgebied der Kapoeasrivier in de Westerafdeeling van Borneo. Door N. Wing Easton. *With Map.*

Malay Archipelago—Borneo. *Mission Field* **44** (1899): 300-304. **Gocher.**
Four Hundred Miles in Sarawak. By the Rev. H. P. Gocher, M.A. *With Illustration.*

Malay Archipelago—Java. **Gennep.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 16 (1899): 259-276.
Opmerkingen naar aanleiding van Dr. J. H. F. Kohlbrugge's 'Geographische Beschrijving van het Jang-Gebergte (Argopoero) op Java.' Door J. L. van Gennep.

Malay Archipelago—Java. **Ijzerman.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 16 (1899): 307-334.
Over Boro-Boedoer. Door J. W. Ijzerman. *With Illustrations.*

Malay States—Selangor. **Rodger.**
Selangor Administration Report for the Year 1898. By J. P. Rodger. Kuala Lumpur, 1899. Size 13½ × 8½, pp. 46.

Persia. *Imp. and Asiatic Quarterly Rev* 8 (1899): 284–315. **Lobb.**
The Coming Struggle for Persia. By R. Popham Lobb. *With Map.*

Philippine Islands. *Export* 21 (1899): 469–470. ———
Die wirthschaftliche Zukunft der Philippinen.

Philippine Islands. *J G Tokyo G.S.* 11 (1899): 210, 292, 361, 439. **Ogawa.**
Philippine Islands. By Jakudzi Ogawa. [In Japanese.]

Route to India. *Scottish G Mag* 15 (1899): 462–470. **Skrine.**
From London to Karachi in a Week. By Francis H. Skrine. *With Map.*
Suggestion for a mail route to India by uniting the Russian railway at Kushk with the Indian system at Chaman by a new line of 438 miles.

Russia—Caucasus. *Rev. G.* 45 (1899): 15–36, 94–123. **Baye.**
Au nord de la chaine du Caucase. Souvenirs d'une mission. Par Baron de Baye. *With Illustrations.*

Russia—Caucasus—Ushba. *Alpine J.* 19 (1899): 524–536. **Rickmers.**
Ushba. By W. Rickmer Rickmers.

Siam. *Mouvement G.* 16 (1899): 409–413. ———
L'avenir du Siam (Troisième article). *With Map.*

Trans-Siberian Railway. *Contemporary Rev.* 76 (1899): 261–271. **Durban.**
The Trans-Siberian Railway. By W. Durban.

AFRICA.

Africa—Anthropology. **Weule.**
Der afrikanische Pfeil. Eine anthropogeographische Studie. Von Dr. Karl Weule. Leipzig: O. Schmidt, 1899. Size 9 × 6, pp. 64. *Plates. Presented by the Author.*
On the geographical distribution of different forms of arrows in Africa.

Africa—Historical. *Deutsche Rundschau G* 21 (1899): 337–343. **Rumpe.**
Afrikas Angliederung an die europäische Culturwelt. Von Dr. Rob. Rumpe.
On the relations between Europe and Africa since the time of Bartholomew Diaz.

Africa—Zoogeography. *G.Z.* 5 (1899): 522–530. **Hesse.**
Die Ausbreitung des Sandflohs in Afrika. Ein tiergeographischer Versuch. Von P. Hesse.

Algeria. **Galland.**
Excursion à Bou-Saada et M'Sila. Racontée par De Galland. Paris: P. Ollendorff [1899]. Size $8\frac{1}{2} \times 11\frac{1}{2}$, pp. 102. *Map and Illustrations.*
Gracefully illustrated notes of travel.

Algeria. **Hay Newton.**
Trade of Algeria for the year 1898. Foreign Office, Annual No. 2302, 1899. Size $10 \times 6\frac{1}{2}$, pp. 38. *Price* $2\frac{1}{2}$*d.*

Algeria. *Renseignements Colon., Comité l'Afrique Française* 3 (1899): 48–56. **Mercier.**
L'expansion de la France dans le sud Algérien. Par M. Gustave Mercier.

Algeria—Sahara. *B. Comité l'Afrique Française* 9 (1899): 176–178. ———
La mission Foureau-Lamy. *With Map.*

British Central Africa. **Sharpe.**
Trade and General Condition of British Central Africa Protectorate for the year 1898–99. Foreign Office, Annual No. 2327, 1899. Size $10 \times 6\frac{1}{2}$, pp. 36. *Price* $1\frac{1}{2}$*d.*

British East Africa. **Macdonald.**
Africa, No. 9 (1899). Report by Lieut.-Colonel Macdonald, R.E., of his expedition from the Uganda Protectorate, May 2, 1898, to March 5, 1899. London: Eyre & Spottiswoode, 1899. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 44. *Price* $4\frac{1}{2}$*d.*

British East Africa: Ruwenzori. **Tucker.**
Toro. Visits to Ruwenzori "Mountains of the Moon." By the Right Rev. A. R. Tucker, D.D. London: Church Missionary Society, 1899. Size 8 × 9, pp. 52. *Map and Illustrations. Price 1s. 6d. Presented by the Church Missionary Society.*

British East Africa—Uganda. **Macdonald and Austin.**

Journeys to the North of Uganda. By Colonel J. R. L. Macdonald and Major H. H. Austin. From the *Geographical Journal* for August, 1899. Size 10 × 6½, pp. 28. *Map and Illustrations.*

British South Africa. **Gill.**

Report of Her Majesty's Astronomer at the Cape of Good Hope to the Secretary of the Admiralty, for the year 1898. London, 1899. Size 12½ × 10, pp. 18.

This report includes a statement as to the progress of the geodetic survey of South Africa. It includes the telegraphic determination of the longitude of Bulawayo and the measurement of a base-line of 11⅞ miles by the Jäderin apparatus. Various important delimitation surveys and determinations of longitude have also been made.

Congo State—Geology. **Cornet.**

Études sur la Géologie du Congo Occidental entre la côte et le confluent du Ruki. Par J. Cornet. (Extrait du 'Bulletin de la Société Belge de Géologie, de Paléontologie et d'Hydrologie,' Tome xi., 1897.) Bruxelles, 1899. Size 9½ × 6½, pp. 311–378. *Sections.*

Egypt. **White.**

The Expansion of Egypt under Anglo-Egyptian Condominium. By Arthur Silva White. London: Methuen & Co., 1898. Size 9½ × 6, pp. xvi. and 484. *Maps. Price* 15*s. Presented by the Publishers.*

This is a politico-historical work largely based on geographical considerations, very clearly arranged, allowing of unusually ready reference, and illustrated by three admirable maps.

Egypt—Emerald Mines. **Karr.**

Eastern Desert of Egypt. Expedition to the Emerald Mines of Sikait and of Zebara. By H. W. Seton Karr. For Streeter & Co., Ltd. Size 10 × 8½, pp. 16. *Maps.*

Egypt—Public Works Department. **Garstin.**

Public Works Ministry. Report upon the Administration of the Public Works Department for 1898. By Sir W. E. Garstin, K.C.M.G. With Reports by the Officers in charge of the Several Branches of the Administration. Cairo, 1899. Size 11 × 7½, pp. 244. *Maps and Illustrations.*

French Congo. *B.S.G. Paris* **18** (1897): 129–178, 340–384 (1899): 496–518. **Julien.**

Du Haut-Oubangui vers le Chari par le bassin de la rivière Kota (Mai—Octobre 1894). Par le capitaine Julien. *With Map.*

French Sudan. *Questions Dipl. et Colon.* **6** (1899): 293–299, 423–430. **Filliâtre.**

Mission chez Samory (Juillet—Novembre 1897). Par M. le Filliâtre.

French West Africa. *Questions Dipl. et Colon.* **8** (1899): 33–41. **Arnaud-Régis.**

La Casamance, le pays Bayotte et le Balantacounda. Étude commerciale. Par P. Arnaud-Régis.

German East Africa—Kilimanjaro. **Meyer—Grossmann.**

M. Deutsch. Schutzgeb. **12** (1899): 143–167.

Barometrische Höhenmessungen am Kilimandjaro im Jahre 1898 von Dr. Hans Meyer. Berechnet von Dr. E. Grossmann.

The full discussion of the barometric and hypsometric observations is given, showing the method of determining the height with all the corrections applied.

German East Africa—Kilimanjaro. **Widenmann.**

Die Kilimandscharo-Bevölkerung. Anthropologisches und Ethnographisches aus dem Dschaggalande. Von Dr. A. Widenmann.—Dr. A. Petermanns Mitteilungen. Ergänzungsheft Nr. 129. Gotha: Justus Perthes, 1899. Size 11 × 7½, pp. x. and 104. *Illustrations.*

German South-West Africa. *Questions Dipl. et Colon.* **8** (1899): 76–86. **Hauser.**

Études sur les Colonies allemandes. III.—Afrique allemande du Sud-Ouest. Par M. H. Hauser. *With Map.*

German West Africa—Kamerun. **Stein.**

M. Deutsch. Schutzgeb. **12** (1899): 119–140, 141–142.

Ueber die geographischen Verhältnisse des Bezirkes Lolodorf (Südkamerungebiet), speziell die dort wohnenden Volksstämme. Von Freiherrn v. Stein. *With Map.*
Ueber das südliche Bakoko-Gebiet. Von Oberleutnant Freiherrn v. Stein.

Kamerun. *Deutsches Kolonialblatt* 10 (1899): 196–199. **Esch.**
Bericht des Geologen Dr. Esch über eine Reise in das Nkossiland.

Madagascar. **Gallieni.**
Renseignements Colon., Comité l'Afrique Française 7 (1899): 101–102.
Le rapport d'ensemble du général Gallieni sur Madagascar. *With Portrait.*

Madagascar. *C. Rd.* 129 (1899): 84–89. **Grandidier.**
Sur les travaux géographiques et cartographiques exécutés à Madagascar par ordre du général Gallieni, de 1897 à 1899. Par M. Alfred Grandidier.

Marocco. **Meakin.**
The Moorish Empire, a Historical Epitome. By Budgett Meakin. London: Sonnenschein & Co., 1899. Size 9 × 6, pp. xxiv. and 576. *Maps and Illustrations. Price* 15*s. Presented by the Publishers.*

An account of the history of Marocco from 500 years B.C to 1894, supported by copious references to the books of reference which have been utilized.

Portuguese East Africa—Delagoa Bay. **Jessett.**
The Key to South Africa: Delagoa Bay. By Montague George Jessett. London: T. Fisher Unwin, 1899. Size 8 × 5½, pp. xviii. and 178. *Maps and Illustrations. Presented by the Author.*

An account based partly on compilation, partly on the observations made during a visit to Delagoa bay in 1897.

Portuguese East Africa—Gaza Land. **Costa.**
Cap. Gomes da Costa. Gaza, 1897-1898. Lisboa: M. Gomes. Size 10 × 6½, pp. 176. *Maps and Illustrations. Presented by the Author.*

The southern portion of Portuguese East Africa is treated under the heads of physical geography, general aspect, races, customs, history, fauna, flora, agriculture, climate and health, commerce, justice, routes, public works, and military and political organization.

Portuguese West Africa. *B.S.G. Lisboa* 16 (1897): 663–669. **Andrade.**
Estudos do planalto do districto de Benguella, do Bihé as Mochico (1897). Por Alfredo de Andrade.

South Africa. *Fortnightly Rev.* 66 (1899): 187–196. **Bryden.**
British and Dutch in South Africa. By H. A. Bryden.

Transvaal. *Imp. and Asiatic Quarterly Rev.* 8 (1899): 338–382. ———
The South African Republic. By Africanus.

Tunisia. *A travers le Monde, Tour du Monde* 5 (1899): 217–220. ———
Bizerte et Ferryville, la création d'une ville en Tunisie. *With Map and Illustrations.*

Tunisia. **Vivian.**
Tunisia and the Modern Barbary Pirates. By Herbert Vivian, M.A. London: C. Arthur Pearson, Limited, 1899. Size 9 × 6, pp. xvi. and 342. *Map and Illustrations. Price* 15*s. Presented by the Publishers.*

The epigrammatic style of this book may be judged from the first lines of the preface: "The authorities on Tunisia are not worth enumerating. Those in English belong to a former generation; those in French are prejudiced and stupid." The author claims that this book will be an indispensable companion to travellers in the country, that it exposes certain sacrifices of British prestige, and pays a tribute to the last survivors of a grand mediæval race. There is a historical chapter, and the greater part of the book deals rather with impressions of the people than with a description of the country.

West Africa. *Imp. and Asiatic Quarterly Rev.* 8 (1899): 327–337. **Bindloss.**
A Glance at Nigeria. By Harold Bindloss.

West Africa. *Blackwood's Mag.* 166 (1899): 275–294. ———
The Loss of Moshi. *With Map.*

NORTH AMERICA.

Alaskan Boundary. *Fortnightly Rev.* 66 (1899): 490–499. **Townsend.**
The Alaskan Boundary Question. By Horace Townsend.

Canada—British Columbia. *P.A. Nat. Sci. Philadelphia* (1899): 121–124. **Vaux.**
Some Observations on the Illecellewaet and Asulkan Glaciers of British Columbia. By George and William S. Vaux, Junr. *With Plates.*

Canada—Quebec. **Chalmers.**
Report on the Surface Geology and Auriferous Deposits of South-Eastern Quebec. By R. Chalmers. Geological Survey of Canada. Part J., Annual Report, vol. x. Ottawa, 1898. Size 10 × 6½, pp. 160. *Map and Illustrations. Presented by the Geological Survey of Canada.*

Contains an interesting history of gold-mining in the eastern townships, the part of Quebec lying south-west of Beauce county and between the St. Lawrence and the boundary of the United States.

Canada—Yukon District. *Rev. Française* **24** (1899): 564–575. **Servigny.**
Au Klondike, vers le pays de l'Or. Par M. J. Servigny. *With Map.*

Newfoundland. *Nineteenth Century* **46** (1899): 223–237. **Des Vœux.**
The Connection of England with Newfoundland. By Sir William Des Vœux, G.C., M.G.

Newfoundland—Labrador. *Climate* **1** (1899): 17–21. **Grenfell.**
Climate and Travel in Labrador. By W. T. Grenfell, M.R.C.S. *With Illustrations.*

The magazine containing this article is mainly devoted to the hygienic requirements of tropical climates, and is published by the Livingstone College.

United States—Arizona. *Globus* **76** (1899): 91–95, 172–174. **Ehrenreich.**
Ein Ausflug nach Tusayan (Arizona) im Sommer 1898. Von Dr. P. Ehrenreich. *With Illustrations.*

United States—Arizona. *Globus* **76** (1899): 53–54, 74–78, 138–142. **Ehrenreich.**
Ein Ausflug nach Tusayan (Arizona) im Sommer, 1898. Von Dr. P. Ehrenreich. *With Map and Illustrations.*

United States—Army. **Miles.**
Annual Report of the Major-General Commanding the Army to the Secretary of War, 1898, and Supplement. Washington, 1898 and 1899. Size 9 × 6, pp. 676; Supplement, 44. *Maps and Illustrations. Presented by General Greely.*

This volume is occupied with official reports and maps of the military operations of the United States army in Cuba, Porto Rico, and the Philippines.

United States—California. *Sierra Club B.* **2** (1899): 312–319. **Baker.**
The Lava Region of Northern California. By M. S. Baker. *With Map and Plates.*

United States—California. *Sierra Club B.* **2** (1899): 295–311. **Manson.**
Observations on the Denudation of Vegetation—a Suggested Remedy for California. By Marsden Manson, PH.D. *With Plates.*

United States—Colorado. **Purington.**
Preliminary Report on the Mining Industries of the Telluride Quadrangle, Colorado. By C. W. Purington.—Eighteenth Annual Report of the U.S. Geological Survey, 1896–97. Part iii. Pp. 745–848. *Plates.* Washington, 1898.

United States—Geological Survey. ——
Eighteenth Annual Report of the United States Geological Survey to the Secretary of the Interior, 1896–97. In Five Parts. Part i., Director's Report, including Triangulation and Spirit Levelling (1897, pp. 440); part iii., Economic Geology (1898, pp. 862); part iv., Hydrography (1897, pp. x. and 756). Washington. Size 12 × 8. *Maps, Diagrams, and Illustrations. Presented by the U.S. Geological Survey.*

These volumes contain a full account of the position of the triangulation of the United States carried out by the Geological Survey to the end of 1897, and of the levelling, with tables of sea-level heights, water-storage, and artesian-well boring in the Western States, and papers on economic geology, which will be entered specially.

United States—Illinois. **Wyndham.**
Coal Mining in the State of Illinois for the year 1898. Foreign Office, Miscellaneous, No. 507, 1899. Size 10 × 6½, pp. 10. *Price 1d.*

United States—Lake Michigan. **Cowles.**
Contributions from the Hull Botanical Laboratory. XIII. The Ecological Relations of the Vegetation on the Sand Dunes of Lake Michigan. By Henry Chandler

Cowles. Reprinted from the *Botanical Gazette*, vol. xxvii. Nos. 2, 3, 4, and 5, 1899. Chicago, 1899. Size 9½ × 7, pp. 95-391. *Map and Illustrations.*

"The province of ecology is to consider the mutual relations between plants and their environment," and this paper deals with the vegetation of the sand-dunes bordering Lake Michigan, in order to show the influence of the sand on the plants and that of the plants on the sand. See note, p. 668.

United States—Minnesota. *Science* **10** (1899): 107-110. **Hall.**
Distribution of the Keewatin in Minnesota. By Prof. C. W. Hall.

On the Keewatin rocks in Minnesota.

United States—New England. *B. Essex I.* **29** (1897): 71-119. **Woodworth.**
Some Glacial Wash-Plains of Southern New England. By J. B. Woodworth. *With Maps.*

United States—North Carolina. **Bassett.**
Slavery in the State of North Carolina. By John Spencer Bassett, PH.D.—Johns Hopkins University Studies in Historical and Political Science. Series xvii., Nos. 7, 8. Baltimore, 1899. Size 9½ × 6, pp. 112.

United States—South Dakota. *National G. Mag.* **10** (1899): 339-343. **Darton.**
Bad Lands of South Dakota. By N. H. Darton. *With Illustrations.*

United States—Washington. **Elliot.**
Catalogue of Mammals from the Olympic Mountains, Washington. With Descriptions of New Species. By D. G. Elliot.—Field Columbian Museum Publication, 32. Zoological Series, vol. i. No. 13. Chicago, 1899. Size 10 × 6½, pp. 241-276. *Plates.*

This catalogue contains a number of interesting views of scenery in the Olympic mountains.

CENTRAL AND SOUTH AMERICA.

Andes. *B.S.G. Lima* **8** (1898): 165-171. **Raimondi.**
Alturas sobre el nivel del mar, de las abras ó pasos de la Cordillera occidental. Por Antonio Raimondi.

Anguilla. **Rat.**
Anguilla. Report on Vital Statistics, 1898. Colonial Reports, Miscellaneous, No. 12, 1899. Size 10 × 6, pp. 20. *Price* 1½*d.*

Argentine Republic. ——
Annuaire Statistique de la Ville de Buénos-Ayres viii^{me} Année, 1898. Buenos-Ayres, 1899. Size 10½ × 7½, pp. xxvi. and 326.

Argentine Republic—Buenos Aires. ——
Anuario de la Dirección General de Estadística correspondiente al Año 1897. Tomo I. Buenos Aires, 1898. Size 11 × 7½, pp. xvi. and 468.

Barbados. **Williams.**
Barbados. Annual Report for 1898. Colonial Reports, Annual No. 262, 1899. Size 10 × 6, pp. 32. *Price 2d.*

Bolivia. *Deutsche Rundschau G.* **21** (1899): 346-354. **Nusser-Asport.**
Einige Wochen auf der bolivianischen Puna. Von Chr. Nusser-Asport.

Brazil—Parà. *L'Esplorazione Com.* **14** (1899): 170, 209, 237, 257. **Manzi.**
Quello che ho Veduto al Parà: Colonizzazione ed Emigrazione. Alberto Manzi.

Chile—Atacama. *B. Geolog. I. University Upsala* **4** (1898): 28-44. **Nordenskjöld.**
Ueber einige Erzlagerstätten der Atacamawüste. Von Otto Nordenskjöld. II.

Colombia. **Nichols.**
The Ores of Colombia from Mines in operation in 1892. By Henry Windsor Nichols, S.B. Field Columbian Museum, Publication 33. Geological Series, vol. i. No. 3. Chicago, 1899. Size 10 × 6½, pp. 125-176. *Map.*

Colombia. *Scottish G. Mag.* **15** (1899): 470-479. **White.**
Brief Notes on the Glacial Phenomena of Colombia (South America). By R. Blake White. *With Illustrations.*

Falkland Islands. **Craigie-Halkett.**
Falkland Islands. Annual Report for 1898. Colonial Reports, Annual No. 263, 1899. Size 10 × 6½, pp. 22. *Price* 1½*d.*

Guadeloupe. *Questions Dipl. et Colon.* 7 (1899): 449–466. **Isaac.**
La Guadeloupe en 1899. Par A. Isaac.

The late M. Isaac represented Guadeloupe in the Upper Chamber of the French Parliament, and being a native of the island, and long charged with high official duties there, his views are of special value.

Nicaragua Canal. *National G. Mag.* 10 (1899): 297-316. **Nimmo and Johnson.**
The Proposed American Interoceanic Canal in its Commercial Aspects. By Joseph Nimmo, Jr., LL.D. The Interoceanic Canal. By Emory R. Johnson.

Nicaragua Canal. *Science* 10 (1899): 97–104. **Hayes.**
The Nicaragua Canal Route. By Dr. C. Willard Hayes.

Paraguay. *Globus* 76 (1899): 78–80. **Lehmann.**
Weitere Mitteilungen über die Guayakis in Paraguay. Von Dr. Rob. Lehmann-Nitsche. *With Illustration.*

Peru. *C. Rd. S.G. Paris* (1899): 283-285. **Bourgeois.**
Nouvelle mesure d'un arc de méridien. Par M. le commandant Bourgeois.

Porto Rico. *Globus* 76 (1899): 133–138. **Hübener.**
Reise-Eindrücke aus Puertorico. Von Dr. Th. Hübener.

South America. *B.S.G. Com. Bordeaux* 22 (1899): 294–302. **Hessel.**
Sur le commerce du "caucho" dans l'Amérique du sud. Par Fred. J. Hessel. *With Sketch-map.*

An account, translated from 'The Indiarubber World' of New York, of a commercial expedition up the Amazon into Peru in search of the quality of indiarubber known in the trade as *caucho*.

West Indies—Hurricane. *National G. Mag.* 10 (1899): 343–348. **Garriott.**
The West Indian Hurricane of August 7–14, 1899. By E. B. Garriott. *With Diagram.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. *Quarterly Rev.* 190 (1899): 289–315. ——
The Federation of Australia.

A study of the position of the Australian colonies in respect to their administration, and the proposed constitution of the federated commonwealth.

Australia—Discovery. **Heeres.**
The part borne by the Dutch in the Discovery of Australia, 1606–1765. By J. E. Heeres, LL.D. Published by the Royal Dutch Geographical Society in commemoration of the XXVth Anniversary of its Foundation. London: Luzac & Co., 1899. Size 14½ × 10½, pp. 6, xviii. and 106. *Maps. Price* 21*s. Presented by the Publishers.*

This important work is printed in Dutch and English. It deals with Dutch voyages to Australasia between 1602 and 1756, and is illustrated with facsimile reproductions of early maps.

Australia—Ethnology. **Mathew.**
Eaglehawk and Crow, a Study of the Australian Aborigines, including an Inquiry into their origin and a Survey of Australian Languages. By John Mathew. London: D. Nutt, 1899. Size 9½ × 6, pp. xvi. and 288. *Map and Illustrations. Price* 18*s. Presented by the Publisher.*

This volume deals with the aborigines of Australia as a whole, and is illustrated by a linguistic map of the continent. The study of the native languages has led the author to believe that the original settlement took place in the north-east, and the linguistic argument is carried out with great completeness. A new classification of Australian languages is given, and there are comprehensive vocabularies allowing the development of many words to be traced.

Australia—Ethnology. *J. and P.R.S. New South Wales* 32 (1898): 66–87. **Mathews.**
Australian Divisional Systems. By R. H. Mathews.

British New Guinea. **Jullien.**
Miss. Catholiques 31 (1899): 293, 306, 317, 328, 346, 352, 370, 380.
Chez les Papous. Une première visite à la tribu des Uni-Uni. Lettre du R. P. André Jullien. *With Map and Illustrations.*

Climatology—Rainfall. **Herbertson.**
The Monthly Rainfall over the Land Surface of the Globe. Inaugural-Dissertation zur Erlangung der Philosophischen Doktorwürde vorgelegt der hohen Philosophischen Facultät der Albert-Ludwigs-Universität zu Freiburg im Breisgau. Von Andrew John Herbertson. Size 10 × 6½, pp. 68. *Maps.*

Geographical Element in Geology. *G.Z.* **5** (1899): 405–406. **Diener.**
Ueber die Bedeutung des geographischen Moments in geologischen Lokalmonographien. Von Prof. D. C. Diener.

Points out the importance of writing local geological memoirs on a geographical basis rather than on the basis of geological formations.

Oceanography. *Ann. Hydrographie* **27** (1899): 458–468. **Krämer.**
Aräometer-, Meeresfarbe- und Plankton-Untersuchungen im Atlantischen und im Stillen Ozean. Von Dr. Augustin Krämer.

Oceanography. *G.Z.* **5** (1899): 509–512. **Krümmel.**
Die tiefste Depression des Meeresbodens. Von Otto Krümmel. *With Map.*

Oceanography. *Scottish G. Mag.* **15** (1899): 505–522. **Murray.**
Address to the Geographical Section of the British Association, 1899. By Sir John Murray, K.C.B., etc. *With Chart.*

Oceanography. *National G. Mag.* **10** (1899): 291–296. **Smith.**
Deep-Sea exploring expedition of the Steamer *Albatross*. By Hugh M. Smith. *With Illustrations.*

The Fish Commission's steamer *Albatross* being on the point of starting for a long scientific cruise in the Pacific, the author takes the opportunity of describing her equipment, and giving a preliminary account of her intended route.

Oceanography. *Petermanns M.* **45** (1899): 177–188. **Supan.**
Die Bodenformen des Weltmeeres. Von Alex. Supan. *With Map and Profiles.*

Sand-plain Formation. *J. Geology* **7** (1899): 452–462. **Fuller.**
Season and Time Elements in Sand-plain Formation. By Myron L. Fuller.

Sea Barriers. *J. Geology* **7** (1899): 445–451. **Newsom.**
The Effect of Sea Barriers upon Ultimate Drainage. By J. F. Newsom.

Terrestrial Magnetism. *B. Philosoph. S. Washington* **13** (1899): 269–336. **Littlehales.**
The Secular Change in the Direction of the Terrestrial Magnetic Field at the Earth's Surface. By G. W. Littlehales. *With Diagrams.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. *Rev. Scientifique* **12** (1899): 405–407. **Gros.**
La géographie médicale. Par M. H. Gros.

On the importance of acquiring knowledge regarding the relation of the progress of disease to geographical surroundings.

Colonisation. ——
Jewish Colonisation Association. Report of the Central Administration to the Council of Administration for the Year 1898. London, 1899. Size 8½ × 5½, pp. 48.

Particulars of the Jewish colonies established in the Argentine republic, United States, Canada, Palestine, and elsewhere.

Commercial Geography—Wheat. **Heiderich.**
Deutsche Rundschau G. **21** (1899): 320-323, 370-372.
Die Weizenproduction der Erde. Von Franz Heiderich.

On the production of wheat in all parts of the Earth.

Historical—Magellan's Voyage. **Pigafetta and Walls y Merino.**
B S.G. Madrid **41** (1899): i.-liii.
Primer viaje alrededor del mundo por el Caballero Antonio Pigafetta; traducción del italiano y notas por D. Manuel Walls y Merino. *With Maps.*

A translation into Spanish of Pigafetta's record of the first circumnavigation of the world.

Historical—Sea Power. *J.R. United Service I.* **43** (1899): 947-967. **Marshall.**
The Importance of Sea Power in the growth of the Roman Empire, and the lessons taught to Great Britain. Lecture by Mr. William W. Marshall.

Historical Maps. *Petermanns M.* **45** (1899): 188-194. **Wieser.**
A. E. v. Nordenskiöld's Periplus. Von F. R. v. Wieser.

A review of Baron Nordenskiöld's great work.

Historical Notes. *B.S.G. Lisboa* **16** (1897): 671-697. **Cordeiro.**
Annotações historicas. De Luciano Cordeiro.

Notes on communications between the Senate of Nuremberg and the kings of Portugal on geographical matters from 1426 to 1520, including several relating to Martin Behaim.

Political Geography. *J.R. Statistical S.* **62** (1899): 489-533. **Flux.**
The Flag and Trade: a Summary Review of the Trade of the Chief Colonial Empires. By A. W. Flux.

BIOGRAPHY.

Almer. *Jahrb. Schweizer-Alpenclub* **34** (1899): 199-224. **Coolidge.**
Christian Almer (1826-1898). Von W. A. B. Coolidge. *With Portrait. Also separate copy, presented by the Author.*

The biography of a famous alpine guide.

Biography. **Plarr.**
Men and Women of the Time. A Dictionary of Contemporaries. Fifteenth Edition, revised and brought down to the present time. By Victor G. Plarr, M.A. London: G. Routledge & Sons, 1899. Size 9½ × 6, pp. x. and 1300. *Price 15s.*

Brinton. *Science* **10** (1899): 193-196. ———
Daniel G. Brinton. By W. J. M. *With Portrait.*

Brinton. *Globus* **76** (1899): 165-166. **Boas.**
Daniel Garrison Brinton. Von Franz Boas. *With Portrait.*

Carranza. *B.S.G. Lima* **8** (1898): 121-136. **Chacaltana.**
El Dr. D. Luis Carranza. Por el Dr. Cesáreo Chacaltana. *With Portrait.*

Grant. **Seton-Karr.**
Grant of Rothiemurchus. A Memoir of the Services of Sir John Peter Grant, G.C.M.G., K.C.B. By Walter Scott Seton-Karr, Esq. London: John Murray, 1899. Size 9 × 7½, pp. xii. and 240. *Portrait. Presented by the Secretary of State for India.*

Sir J. P. Grant served in India from 1828 to 1862, and in Jamaica from 1866 to 1874. The first part of this book is a biographical memoir, the second a selection from Grant's official reports and minutes on many matters of interest regarding India and Jamaica.

Humboldt. ———
Wissenschaftliche Beiträge zum Gedächtniss der hundertjährigen Wiederkehr des Antritts von Alexander von Humboldt's Reise nach Amerika am 5. Juni 1799. Aus Anlass des Siebenten Internationalen Geographen-Kongresses herausgegeben von der Gesellschaft für Erdkunde zu Berlin. Berlin: W. H. Kühl, 1899. Size 11 × 7½, pp. 54, 248, and 32. *Maps and Facsimiles. Presented by Dr. J. Scott Keltie.*

This elegant volume contains three memoirs, the first notes regarding some unpublished letters of Humboldt's before his departure for South America, together with the text of the letters and some facsimiles. The others deal with the progress of knowledge in the hundred years since Humboldt's activity began in the departments of phyto-geography, by Prof. Engler, and atmospheric isotherms, by Prof. Meinardus.

GENERAL.

Ballooning. *C. Rd.* **129** (1899): 527-529. **Hermite.**
Sur un voyage aérien de longue durée, de Paris à la Méditerranée, exécuté le 16-17 Septembre dernier. Note de M. Gustave Hermite.

Notes of a balloon trip of 407 miles from Paris to the Mediterranean, the distance being accomplished in 15 hours 8 minutes, *i.e.* an average rate of 27 miles per hour.

Bibliography. **Baschin.**

Bibliotheca Geographica, herausgegeben von der Gesellschaft für Erdkunde zu Berlin. Bearbeitet von Otto Baschin. Band v. Jahrgang 1896. Berlin: W. H. Kühl, 1899. Size 9 × 6, pp. xviii. and 450. *Presented by the Gesellschaft für Erdkunde, Berlin.*

This issue of the *Bibliotheca Geographica* contains numerous improvements, of which the most important is the addition of an index to authors' names. The volume contains 9400 titles, in the collection of which over 800 journals have been looked through, as well as the best bibliographical catalogues of all countries. It is extremely gratifying to find that this work, invaluable to the geographer, has been recognized as of public utility by the German Emperor, who has made a special grant towards its expenses. It has also been officially recognized by the International Geographical Congress as fully meeting all the requirements of an international geographical bibliography.

Bibliography—Catalogue. ———

Société de Géographie de Lille, Roubaix, Tourcoing et Valenciennes. Supplément au Bulletin de Juillet 1899. Catalogue de la Bibliothèque. Juin 1899: Lille, 1899. Size 10 × 6½, pp. 110.

British Empire. **Wachs.**

Die Etappenstrasse von England nach Indien um das Kap der Guten Hoffnung. Von Otto Wachs. Berlin: E. S. Mittler und Sohn, 1899. Size 9½ × 7, pp. 62. *Price* 1*s.* 6*d.*

This memoir, a reprint from the 'Marine-Rundschau' for 1899, deals with the strategic aspect of the routes to India through the Suez Canal and by the Cape of Good Hope with regard to their value to the British Empire, and the possibility of France or other Powers blocking or embarrassing traffic.

Canada. *Miss. Catholiques* 31 (1899): **Geelen.**

Chez les Sauteux du lac Winnipegosis. Lettre du R. P. Ph. Geelen.

Church Missionary Society. ———

Proceedings of the Church Missionary Society for Africa and the East, One Hundredth Year, 1898–99. London: Church Missionary House, 1899. Size 8½ × 6, pp. lxxvi., 472, and 400. *Maps. Presented by the Church Missionary Society.*

Educational—Text-book. **Supan.**

Allgemeine Erdkunde als Anhang zur Deutschen Schulgeographie. Von Prof. Dr. A. Supan. Gotha: Justus Perthes, 1898. Size 9 × 6, pp. 56. *Price* 60*pf.*

A general introduction to the principles of geography.

Education—University. **Löffler.**

Die Geographie als Universitätsfach zunächst im Anschluss an einen Vortrag im Studentenverein. Von Dr. E. Löffler. Kopenhagen: Lehmann & Stage; Leipzig: Otto Harrassowitz. 1899. Size 8 × 5½, pp. 32. *Presented by the Author.*

On the positions of Geography as a subject for University study and instruction.

Exploration. **Hasse.**

Reports of Explorations printed in the Documents of the United States Government. [A contribution toward a Bibliography.] Compiled by Adelaide R. Hasse. Washington, 1899. Size 9½ × 6, pp. 90. *Presented by the Compiler.*

This bibliography deals with explorations in all parts of the world, but mainly in North America.

Geographical Congress. *Nature* 60 (1899): 632–634. ———

The Seventh International Geographical Congress.

Geographical Congress. **Wagner.**

Der vii. Internationale Geographenkongress zu Berlin, 28 Septembre bis 4 Oktober 1899. Von Hermann Wagner.—Geographischer Anzeiger herausgegeben von Justus Perthes in Gotha. September, 1899, pp. 1–2. Size 11 × 9.

Geographical Orthography. *Rev. G.* 45 (1899): 161–178. **Garnier—Ammann.**

Méthode de transcription, rationnelle générale des noms géographiques (T.R.G.) Par Christian Garnier. Par Prof. A. Ammann.

Geographical Orthography. *Petermanns M.* 45 (1899): 194–196. **Sieger.**

Chr. Garniers Versuch einer allgemeinen Transskription geographischer Namen. Von Prof. Dr. R. Sieger.

Geographical Progress. *B.S.G. Paris* 18, 1897 (1899): 385–472. **Maunoir.**

Rapport sur les travaux de la Société de Géographie et sur les progrès des sciences géographiques pendant l'année 1896. Par Ch. Maunoir.

Geography. **Mill.**

The International Geography. By Seventy Authors. With 488 Illustrations. Edited by Hugh Robert Mill, D.SC. London: George Newnes, Limited, 1899. Size 9 × 6, pp. xx and 1088. *Maps. Price* 15*s. Two copies, one presented by the Publishers, one by the Editor.*

Each section is the work of a specialist. The book is divided into two parts, one dealing with the Principles of Geography in 121 pp., the other describing the continents and countries of the world, with special chapters on the arctic and antarctic regions. The authors include Sir Clements Markham, Sir John Murray, Sir Charles Wilson, Sir Harry Johnston, Sir Frederic Goldsmid, Sir Martin Conway, Sir William Macgregor, Sir George Robertson, Dr. Nansen, Mr. Selous, Mr. James Bryce, Mrs. Bishop, Count Pfeil, Profs. Kirchhoff, de Lapparent, Davis, Penck, Kan, Keane, Dr. J. Scott Keltie, Dr. Thoroddsen, Mr. Warington Smyth, Captain Vasconcellos. See review, p. 656.

German Colonies. ———

Kolonial-Handels-Adressbuch, 1899. Herausgegeben von dem Kolonial-Wirtschaftlichen Komitee. Beilage zum Deutschen Kolonialblatt 1899. Berlin. Size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. 90. *Maps.*

A directory of the commercial firms in the German colonies, together with many data of commercial interest, and a set of maps of the colonies showing the position of all trading centres and trade-routes.

Missionary Reports. ———

Free Church of Scotland. Sixty-ninth Report on Foreign Missions to the General Assembly of the Free Church of Scotland. May, 1899. Edinburgh, 1899. Size $9 \times 5\frac{1}{2}$, pp. 124, 84, 26, 16, 20, 14.

Names on Maps. *J. Manchester G.S.* 14 (1898): 297–303. **Crook.**

The Orthography, Location, and Selection of Names for the National Maps. By Henry T. Crook.

NEW MAPS.

By J. COLES, *Map Curator*, R.G.S.

EUROPE.

Berlin. **Königl. Preuss. Geolog. Landesanstalt.**

Geologische Uebersichtskarte der Umgegend von Berlin. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Herausgegeben von der Konigl. Preuss. Geolog. Landesanstalt. Siebenter Internationaler Geographen-Kongress, Berlin, 1899.

Berlin. **Müller.**

Neuer Verkehrs-Plan von Gross-Berlin, bearbeitet von Gustav Müller. Kartograph der Königl. Preuss. Landesaufnahme. Scale 1 : 20,000 or 0·3 stat. mile to an inch. Berlin, 1899. Deutsches Kartographisches Institut. Betheke and Reiss. viii. Internationaler Geographen-Kongress, Berlin, 1899.

Denmark. **Danish General Staff.**

Generalstabens topografiske Kaart over Danmark. Scale 1 : 40,000 or 1·6 stat. mile to an inch. Kalkograferet og graveret ved Generalstaben, Kjöbenhavn, 1898, 1899. Sheets: Vorsaa, Kollerup, Klitmöller, Hanstholm, Bolbjerg. *Presented by R. Danish Ministry of War.*

England and Wales. **Ordnance Survey.**

Publications issued since October 8, 1899.

1-inch:—

ENGLAND AND WALES (revision):—96, 233. Hills engraved in black or brown. 1*s.* *each.*

6-inch—County Maps:—

ENGLAND AND WALES (revision):—**Cheshire,** 3 S.W., S.E., 6 S.E., 7 N.W., N.E., 8 N.E., 12 N.E. S.W., S.E., 13 S.W., S.E., 14 S.W., 16 S.W., 17 N.W., N.E., 20 S.E., 22 N.W., N.E., S.W., 23 S.W., S.E., 24 N.E., S.E., 30 S.E., 31 N.E., S.E., 37 N.W., S.E., 39 N.E., S.E., 41 S.W., 44 S.W., 46 S.E., 47 S.E., 48 N.W., 54 N.W., S.E., 56 N.E. **Derbyshire,** 8 N.W., S.E., 9 S.E.,

New South Wales. *J. and P.R.S. New South Wales* **32** (1898): 88-103. **Boultbee.**
Artesian Water in New South Wales. By J. W. Boultbee.

An account of the progress being made in the west of New South Wales in irrigating land by means of deep artesian wells, the boring of which is believed to be practicable over 60,000 square miles.

New South Wales—Jenolan Caves. ———
The Jenolan Caves and the Blue Mountains. By Argus. Parramatta, 1898. Size 10 × 7½, pp. 54. *Plans and Illustrations. Price* 1*s. Presented by the Agent-General for New South Wales.*

The New South Wales Government has provided the Jenolan caves with footways and illuminated them with electric light, so as to make their remarkable features accessible to visitors.

New Zealand. *P.I. Civil Engineers* **136** (1899): 265-267. **Rawson.**
Westport Harbour, New Zealand.—Wave Basin. By T. H. Rawson. *With Plan.*

New Zealand. **Grace.**
A Sketch of the New Zealand War. By Morgan S. Grace, C.M.G. London: H. Marshall & Son. 1899. Size 7½ × 5, pp. 172. *Map and Portraits. Price* 3*s.* 6*d. Presented by the Publishers.*

Personal recollections of the Maori war of 1860.

Pacific Islands. **Pfeil.**
Studien und Beobachtungen aus der Südsee. Von Joachim Graf Pfeil. Braunschweig. F. Vieweg und Sohn, 1899. Size 10½ × 7, pp. xiv. and 322. *Illustrations. Presented by the Author.*

This finely illustrated volume contains an account of the observations made by Count Pfeil in New Guinea and the neighbouring islands.

Queensland. **Rutlidge.**
Guide to Queensland. Compiled . . . by Charles Schaefer Rutlidge. London: Dean & Son [1899]. Size 9 × 5½, pp. 174. *Map and Illustrations. Presented by the Author.*

Samoa. *G.Z.* **5** (1899): 489-508. **Krämer.**
Die wirtschaftliche Lage auf Samoa und in der umgebenden Südsee. Von Dr. Augustin Krämer.

Tasmania. *T.R.G.S. Australasia* (*Victoria*) **16** (1898): 38-42. **Shillinglaw.**
Notes on an Original Chart of the South and East Coasts of Tasmania (supposed to have been constructed by Capt. Tobias Furneaux). By J. J. Shillinglaw.

Tasmania—Furneaux Islands. *J. Manchester G.S.* **14** (1898): 355-360. **Stephens.**
The Tasmanian Half-Castes of the Furneaux Islands. By Edward Stephens.

POLAR REGIONS.

Andrée's Expedition. *A travers le Monde, Tour du Monde* **5** (1899): 245-246. ———
Le Ballon d'Andrée. Son itinéraire hypothétique. *With Map.*

Antarctic. **Arçtowski.**
The Antarctic Climate. By Henry Arçtowski. From the *Geographical Journal* for October, 1899. Size 10 × 6½, pp. 8.

Antarctic. **Cook.**
Through the First Antarctic Night. A lecture by Dr. Frederick A. Cook. From the *Buenos Aires Christian Advocate and the Epworth Herald*, vol. vi. No. 5. Buenos Aires, May, 1899. Size 15 × 11, pp. [3].

Antarctic. *Mouvement G.* **16** (1899): 228-229, 240-242. **Gerlache.**
L'expédition antarctique Belge. Par M. De Gerlache.

Swedish Arctic Expedition. **Nathorst.**
The Swedish Arctic Expedition of 1898. By Prof. A. G. Nathorst. From the *Geographical Journal* for July and August, 1899. Size 10 × 6½, pp. 48. *Maps and Illustrations.*

MATHEMATICAL GEOGRAPHY.

Geodesy. **Ferrero.**
Association Géodésique Internationale. Rapport sur les Triangulations présenté à

la Douzième Conférence Générale à Stuttgart en 1898. Par le général A. Ferrero. Florence, 1899. Size 12 × 9, pp. xxxvi. and 454. *Map and Plates.*

The map shows the present state of the triangulated surveys of Europe.

Geodesy. **Hirsch.**

Comptes-rendus des séances de la Douzième Conférence Générale de l'Association Géodésique Internationale réunie à Stuttgart du 3 au 12 Octobre 1898, rédigés par le Secrétaire perpétuel A. Hirsch, publiés en même temps que les Rapports spéciaux sur les progrès de la Mesure de la Terre, et les Rapports des Délégués sur les travaux géodésiques accomplis dans leurs pays. Berlin: D. Reimer, 1899. Size 12 × 9, pp. 582. *Maps and Diagrams. Presented by the Centralbureau der Internationalen Erdmessung, Potsdam.*

The proceedings of the Twelfth International Geodetic Conference, at which Great Britain was represented for the first time (by Prof. George Darwin). It contains a report on the measurements of deviation from the vertical at several stations, a series of reports on the observations of latitude changes in all parts of the world, gravity observations with the pendulum in various places and a report on the progress of triangulation in different European countries and in the United States.

Geographical Distances. **Détrez.**

Recherches sur les Distances géographiques et en particulier sur celle de Calais à Douvres. Par G. Détrez. 2ᵉ Édition. Lille: G. Détrez, 1896. Size 10 × 6½, pp. 32. *Presented by the Author.*

Discusses the various values assigned to the distance between Dover and Calais. This involves a discussion of the value of the units employed, especially the *league;* often it can be arrived at by comparison with other distances cited as equal, greater, or less. The author then gives the measurement of the distance on the French map on the scale 1 : 80,000, and finally calculates from the latitude and longitude of the two positions the great circle and loxodromic distances respectively. The three last come out as 41·30, 41·516, 41·548 kilometres.

Horizon. *C.Rd.* **129** (1899): 272–274. **Forel.**

Les variations de l'horizon apparent. Note de M. F.-A. Forel.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Atmospheric and Oceanic Currents. **Bjerknes.**

K. Svenska Vet.-A. Handlingar 31 (4) (1898): 136.

Ueber einen hydrodynamischen Fundamentalsatz und seine Anwendung besonders auf die Mechanik der Atmosphäre und des Weltmeeres. Von V. Bjerknes. *Plates.*

The author argues that the causes of the great movements of the atmosphere and the ocean are to be sought always in differences of density which are *not* caused by pressure. These causes are explained by formulæ and statements based on the recognition of isobaric and isosteric surfaces, enclosing between them isobaric and isosteric sheets and solenoids.

Atmospheric Tides. *C. Rd.* **129** (1899): 529–533. **Poincaré.**

Écarts barométriques sur le méridien du Soleil aux jours successifs de la révolution tropique de la Lune. Note de M. A. Poincaré.

Aurora. *K. Svenska Vet.-A. Handlingar* 31 (3) (1898): 1–46. **Ekholm and Arrhenius.**

Ueber die nahezu 26-tägige Periode der Polarlichter und Gewitter. Von Nils Ekholm und Svante Arrhenius. *With Diagram.*

On the periodicity of auroral displays and thunderstorms nearly approaching the period of the lunar month.

Aurora, etc. **Ekholm and Arrhenius.**

K. Svenska Vet.-A. Handlingar 31 (2) (1898): 1–78.

Ueber den Einfluss des Mondes auf Polarlichter und Gewitter. Von Nils Ekholm und Svante Arrhenius. *With Diagrams.*

The authors, having previously demonstrated that the position of the moon exercises an important influence on atmospheric electricity in general, now show that this influence is also apparent in the phenomena of the aurora and of thunderstorms.

Climatology. *Meteorolog. Z.* **16** (1899): 317–319. **Polis.**

Anwendung von meteorologischen Beobachtungen in der medicinischen Klimatologie. Von Dr. P. Polis.

Shwebo, Pakôkku, Sagaing, and Mandalay (Upper Burma); of Northern Arakan (Lower Burma); and of the districts of Chittagong and Native State of Hill Tippera (Bengal), Seasons 1853–66, 1871-72, and 1889-94; 2 s.w. (2nd edition), 1 inch to 4 miles; parts of districts Chittagong (Bengal), Northern Arakan, Akyab, and Kyaukpyu (Lower Burma), and Pakôkku (Upper Burma), Seasons 1853–61 and 1887-97; 2 s.e. (5th edition), parts of districts Pakôkku, Minba, Myingyan, Meiktila, Yamithin, Magwè, and Chin Hills (Upper Burma), Seasons 1885–87 and 1889-91 and in 1897.—Central India and Rajputana Survey, 1 inch to a mile. No. 379. parts of district Hoshangabad (Central Provinces) and Native State of Bhopal (C. I. Agency), Seasons 1863-65-67-68-73-74.—North-Western Provinces and Oudh, 1 inch to a mile. Dehra Dun and Siwâliks (2nd edition), Seasons 1873-76. 4 sheets.—Madras Presidency. 32 miles to an inch, with additions to 1897.—Upper Burma (2nd edition), 65 miles to an inch, 1898.—The Provinces of Bengal, Bihar, Orissa, and Chota Nagpur, 16 miles to an inch, additions and corrections to railways and boundaries, 1898. 2 sheets.—Burma and adjacent countries, 32 miles to an inch (2nd edition), additions and corrections to 1898. 2 sheets.—District Jalpâiguri and the Native State of Cooch Behar, 4 miles to an inch, additions to 1898.—District of Rawâlpindi, 1 inch to a mile, Seasons 1853–55, 4 sheets.—District Raipur, Central Provinces, 20 miles to an inch, 1899.—District Mandla, Central Provinces, 8 miles to an inch, 1899.—District Seoni, Central Provinces, 8 miles to an inch, 1899.—District Shahpur, Punjab, 8 miles to an inch, 1899.—District Betúl, Central Provinces, 8 miles to an inch, 1899.—District Gurgaon, Punjab, 8 miles to an inch, 1899.—District Hoshiárpur, Punjab, 8 miles to an inch, 1899.—District Nimar, Central Provinces, 8 miles to an inch, 1899.—Districts Noákhâli and Bengal, 8 miles to an inch, 1899.—District Monghyr, Lower Provinces (Bihar), 4 miles to an inch, additions and corrections to 1898.—District Jhelum, Punjab, 4 miles to an inch, 1899.—District Rawalpindi, Punjab, 4 miles to an inch, 1899.—Levels in the Punjab: No. 88, parts of districts Montgomery and Ferozepore, Baháwalpur and Bickaneer States, 2 miles to an inch, 1898.—Charts of Triangulation: Central Provinces, 2 miles to an inch. Sheets Nos. 8, 9, 10, 11, 13, 14, 15, 17, 19, 20, 23, 24, 25, 26, 27, 28, 34, 35, 36, 37, 38, 39, 63, 64, 82, 83, 84. Seasons 1887-96, 1898.—Charts of Triangulation and Traverse: Sind, 2 miles to an inch. Sheets Nos. 15, 19, 20, 32, 33, 34, 38, 47, 48, 49, 50, 57, 66, 67, 68, 69, 105. Seasons 1895-98, 1899.—Chart of Triangulation: Shan States, Upper Burma, 4 miles to an inch, Seasons 1895-97, 1899.—Chart of Triangulation, 2 miles to an inch: Himalaya. Sheet No. 311 (Punjab), 2nd edition, Seasons 1886-91, 1899.—Index to the Great Trigonometrical Survey of India, 96 miles to an inch, 1893.—Index to the Indian Atlas, 1899.—*Presented by H.M. Secretary of State for India, through the India Office.*

AFRICA.

Boer Republics. **'Daily Mail.'**

The 'Daily Mail' Map of the Boer Republics, etc., to illustrate the Present Crisis in the Transvaal. Scale 1 : 1,900,800 or 30 stat. miles to an inch. George Philip & Son, London and Liverpool, 1899. *Price 1s. Presented by the Publishers.*

Congo. **Droogmans.**

Carte du Bas-Congo. Scale 1 : 500,000 or 7·8 stat. miles to an inch. H. Droogmans, 1899. Brussels: A. de Schaepmeester.

Natal Frontier. **Philip.**

Philips' Large Scale Military Map of the Seat of War on the Natal Frontier. Scale 1 : 316,800 or 5 stat. miles to an inch. George Philip & Son, London and Liverpool, 1899. *Price 1s. Presented by the Publishers.*

This, like the *Daily Mail* map mentioned above, is mainly an outline map, but the chief physical features are roughly indicated.

South Africa. **Stanford.**

Stanford's New Map of the Orange Free State, the Southern Part of the South African Republic, the Northern Frontier of Cape Colony, Natal, Basutoland, and Delagoa Bay in Portuguese East Africa. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. E. Stanford. London, 1899. *Presented by the Publisher.*

There is no hill shading on this map, and nothing to indicate the physical features of the country, except that the heights of several places, peaks, and passes, are given in figures. The map in other respects will be found useful for reference in connection with the movements of troops at the present time; an edition, with the physical features inserted, would be still more valuable.

AMERICA.

Canada. **Surveyor-General of Canada.**

Sectional Maps. Scale 1: 190,080 or 3 stat. miles to an inch. Sheets: 91. Sicamous; 93, Yale; 94, Lytton; 95, Kamloops. Topographical Surveys Branch. Department of the Interior, Ottawa, 1899. *Presented by the Surveyor-General of Canada.*

AUSTRALIA.

Coolgardie. **Blatchford and Allhusen.**

Geological Map of Coolgardie. Scale 220 yards to an inch. Geological lines by Torrington Blatchford and E. L. Allhusen, 1898. Geological Survey of Western Australia. 4 sheets. *Presented by the Director of the Geological Survey of Western Australia.*

This is a geologically coloured map of Coolgardie, which will be chiefly interesting to mining engineers, and persons concerned in the gold-mines of the district.

GENERAL.

World. **Meyer.**

Meyer's Hand-atlas. Zweite, neubearbeitete und vermehrté Auflage mit 112 Kartenblättern, 9 Textbeilagen und Register aller auf den Karten verzeichneten Namen. Parts 27 and 28 (in one) and 29 and 30 (in one). Leipzig und Wien. Verlag des Bibliographischen Instituts, 1899. *Price* 60*pf. each issue.*

CHARTS.

Russian Charts. **Chief Hydrographic Department, St. Petersburg.**

Charts and Plans published by the Chief Hydrographic Department. Ministry of Marine, St. Petersburg.

The Baltic.

No.
529. Plan of the Port of Pernau. Scale 700 feet to an inch. 1899.
536. Kronstadt—Plan of Docks. 1899.
517. Part of River Neva and Dock, St. Petersburg. Scale 70 feet to an inch. 1898.

The White Sea and Arctic Ocean.

541. Plan of Yugor Strait. Scale 1·15 mile to an inch. 1899.
538. Plan of Entrance to Unskoi Bay. Scale 1750 feet to an inch. 1899.

The Black Sea.

531. Plan of Sinope. Scale 2485 feet to an inch. 1899.
539. Plan of Kustenji Roadstead. Scale 1015 feet to an inch. 1899.

The North Pacific Ocean.

532. Plan of Port Chestakof, Korea. Scale 1302 feet to an inch. 1899.
543. Plan of Port Arthur. Scale 1505 feet to an inch. 1899.
1813. Chart of Strelok Bay and Askold Strait. With Putiatin and Askold Islands, Peter the Great Bay. Scale 4550 feet to an inch. 1899.

Presented by the Chief Hydrographic Department, St. Petersburg.

Southern Ocean. **Meteorological Office.**

Meteorological Charts of the Southern Ocean between the Cape of Good Hope and New Zealand. Meteorological Office, London, 1899. *Price* 12*s*. *Presented by the Meteorological Office.*

The charts included in this atlas have been compiled from the four-hourly observations of about 2000 logs, kept for the Meteorological Office between the years 1855 and 1895, as well as from about 450 logs of Her Majesty's ships. They are bounded in latitude by the parallels of 30° and 60° S., and in longitude by the meridians of 10° and 180° E. The direction and force of the wind is shown for areas of 3° of latitude by 10° of longitude, as well as the barometrical pressure by isobars, and the temperature of the air and sea-surface by isotherms. The regions of excessive range of sea-surface temperature are indicated by shading.

The amount of fog is shown by percentages of the total number of weather observations, and also graphically by curves. Currents are shown in separate monthly charts.

The atlas contains a large amount of information that will be useful to mariners, and persons interested in the study of meteorology.

United States Charts. **U.S. Hydrographic Office**

Pilot Charts of the North Atlantic Ocean for September and October, 1899, and North Pacific Ocean for October, 1899. Published at the Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Pacific Islands. **Lucas**

Eighty-two Photographs of British and German New Guinea, New Britain, Solomon Islands, Santa Cruz Group, and New Hebrides. Taken by W. A. Lucas, of Balmain, N.S.W. *Presented by C. M. Woodford, Esq.*

This set of photographs comprises 82 photographs of scenery and the natives of the Western Pacific, as will be seen by the following list:—

British and German New Guinea.—(1) Village of Ela-vara, Port Moresby; (2) Village of Hanua-bada, Port Moresby; (3) Village of Tanua-bada, Port Moresby; (4) Native girl, Port Moresby; (5) Native village, Yule island, Gulf of Papua; (6) Group of natives, Yule island; (7) Yule island natives; (8) Bushi-mi-mi, Mambaie chief; (9) Sariba, near Samarai; (10) Scene at Sariba; (11) Native group, Sariba; (12) Native houses, Milne bay; (13) Native canoes, Dobu, D'Entrecastreaux Group; (14) Native houses, Freidrich Wilhelmshafen; (15 and 16) Natives in gala dress; (17) Trading canoe.

New Britain.—(18) Matupi, Blanche bay; (19) Rock in Blanche bay thrown up by an earthquake about thirty years ago; (20) Native group at fishing village, Blanche bay; (21) Fishing village, Herbertshöhe; (22) Fishtraps, anchors, and cables, Herbertshöhe; (23) Playing cat's-cradle; (24) Typical native; (25) Mioko, Duke of York group; (26) Pudding-making, Mioko; (27) Typical canoe, Mioko.

Solomon Islands.—(28) Head house, Simbo; (29) Native of Western Solomons; (30) Panna, a young Simbo chief; (31) Hunchback, Simbo; (32) Group of natives, Ronongo; (33) War canoe, house of Ingowar, chief of Rubiana (New Georgia); (34) Native village, Rubiana; (35) Rubiana boys in typical dress; (36) Two Sisieta men (Rubiana); (37) "Tambo" house and canoes, Sisieta; (38) Rubiana warrior with wicker shield, or "lavi"; (39) Rubiana head, showing pearl inlaid earring; (40) Chief's tomb, Savo; (41) Savo house; (42) Village of Baranago (Ngela), New Florida; (43) Giant canoe house, Baranago, 110 feet by 50 feet; (44) Killing the pigs; (45) Singeing and cutting up the pigs; (46) A party of the guests; (47) Tambikoro, dividing the food; (48) Party of guests subdividing the food; (49, 50) Malayta boy; (51) Group of Malayta boys; (52) Village of Aola, Guadalcanar; (53) Typical house, Aola; (54) Gnassi, an Aola native; (55) Buying copra at Marau, Guadalcanar; (56) Weighing out copra to export vessel, Marau; (57) a saltwater creek, Danae bay, Marau; (58) Waisari, principal chief of East Guadalcanar, and two minor chiefs; (59) Mangara, chief of Marau; (60) Typical group at Komachu islands, Marau; (61) Borassi, chief of Komachu islands, and family; (62) Guadalcanar house; (63) a Marau family; (64) Marau boys; (65) Marau maidens; (66) Mowi, chief of Adappo, with his children and grandchildren; (67) Native of Matuia, San Christoval.

Santa Cruz Group.—(68) Reef island women; (69) Typical house, Santa Cruz; (70, 71, 72) Types of Santa Cruz natives; (73) "Tambo" house, village of Lacmbay, Utupua; (74, 75) Beach scenes, Basilisk harbour, Utupua; (76) Tropical foliage, Santa Cruz; (77, 78, 79) Reef island canoes; (80) A Reef island's fleet on the beach at Carlisle bay, Santa Cruz.

New Hebrides.—(81) Native drums, Mèli, Sandwich island, or Efate; (82) Typical house, Vila.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

n
l,
o-
e,
s,
y
.
e
e,
l,
e
.
,
i
,
-
,
l

INDEX.

* Denotes Articles and Papers. † New Publications.

A.

Aachen, Temperaturbeobachtungen zu, von Dr. Polis, 676 †
Abbate Pasha, Khartoum-Omdourman et la chute du Mahdisme, 459 †
Aberdare range, East Africa, 283
Aborigines of Formosa, Ino Kakyo on, 443
Absaroka Range, Early Tertiary Volcanoes of the, by A. Hague, 339 †
Abyssinia—
Capital of, Position of, 564
Russian explorations south of, 664
Voyages en Abyssinie, par V. Buchs, 117 †
Aconcagua, Sir M. Conway's ascent of, 26
Adamawa—
German progress in, 565
Völkerstämme an der Südgrenze Adamawas, von Hauptmann Hutter, 337 †
Adamello und des St. Gotthard, Gebieten des, von Dr. Salomon, 221 †
Adams, H. B., Jared Sparks and Alexis de Tocqueville, 340 †
Address to the R.G.S., by Sir C. R. Markham, 1 *; Opening Address to R.G.S., session 1899-1900..593
Adelaide Branch of the Royal Geographical Society of Australasia, Congratulations by, on the Antarctic Expedition, 203
Adis Ababa, Position of, 564
Adji Chai, Lake Urmi region, 508
Adler, C., The International Catalogue of Scientific Literature, 466 †
Admiralty charts, 127, 349-351, 591
Admiralty Surveys during 1898..83; Report on, by Sir W. Wharton, 343 †
Adour river, change of course of the, 406
Adriatic—
Temperatura e del colore delle acque fatte nell' Adriatico, del A. Riccò e G. Saija, 123 †
Advent bay, Spitsbergen, 63
Africa—
Africa, No. 9, Report by Colonel Macdonald on his Expedition from Uganda, 680 †
Africa—*continued.*
Afrikanische Transcontinentalbahn, von G. Hayek, 226 †; Afrikanische Pfeil, Der, von Dr. K. Weule, 680 †
Afrikas Angliederung an die europäische Culturwelt, von Dr. Rumpe, 680 †
Afrique lusitanienne, par G. Vaes, 337 †
After Big Game in Central Africa, by M. Foa, 459 †
Ausbreitung des Sandflohs in, von P. Hesse, 680 †
Bechuanaland Railway, Correspondence with Mr. C. Rhodes relating to the, 458 †
Britain in Africa, by M. Seton, 336 †
British Central, A Game-preserve in, 211; Trade, etc. (Foreign Office Rep.), 680 †
British East: From Njemps to Marich. Save, and Mumia's, by Major Austin, 307; Photographs of, by Sir G. L. Molesworth, 352; Road-making and Surveying in, by Captain Smith, 269 *
British South: Rhodesia, 1889-99 (Simpkin & Co.), 582 †; Papers relating to British South Africa Co., 338 †; Report of Her Majesty's Astronomer at the Cape of Good Hope, 681 †
Bukoba, Der Bezirk, von Oberleutnant Richter, 460 †
Central: Vingt-Deuxième traversée de l'Afrique Centrale, par A. J. Wauters, 226 †; Photographs taken in, by D. Crawford, 352
Climate of Tropical Africa, Report of Committee on, 226 †, 547
Convention Franco-Anglaise, 337 †
Deux ans et demi au continent mystérieux, par M. Payeur-Didelot, 228 †
East: La seconda spedizione Bòttego nell' Africa Orientale, di Vannutelli e Citerni, 117 †
French West: A travers la Guinée et la Fouta-Diallon, La Mission Macland, 582 †; La Region Française du Tchad, par A. Monteil, 583 †; La

Africa—*continued.*
Casamance, par P. Arnaud-Régis, 681 †
German East: Notizie sull' Africa Orientale Tedesca, del G. Pestalozza, 118 †; Die Gletscher des Kilimandjaro, von Dr. Meyer, 118 †; Geographischen Ortsbestimmungen des Hauptmanns Ramsay, etc., 460 †; Geographical work in, 321; Dr. Dantz' geological explorations in, 446
German South-West: Mit Schwert und Pflug in Deutsch Südwestafrica, von K. Schwabe, 337 †; Note on the Pillar erected by Diaz near Angra Pequena, by W. L. Sclater, 337 †; Astronomische Ortsbestimmungen in Südwest-Afrika, von Hauptmann von Estorff, 227 †; Besiedelung Deutsch-Sudwestafrikas, von Dr. E. v. Reichenbach, 227 †; Études sur les Colonies allemandes, par H. Hauser, 681 †
Haut-Oubangui, Mission de Béhagle, 459 †
Invasion européenne en Afrique, par Ed. Foa, 226 †
Livingstone's tree, Mr. Codrington's expedition to, 317, 444
Maps: Foa's journeys in Africa, 126; 'Daily Mail' Map of the Boer Republics, 694; Stanford's New Map of the Orange Free State, etc., 694
Marchand, Retour de, par G. Demanche, 336 †
Middlebrooks Photographien aus dem Leben der Zulukaffern, 118 †
Modern Buddhism and Kindred Institutions in Pagan Africa, by Rev. F. Snelson, 458 †
Populations naines de l'Afrique, par Lieut. Dubreucq, 117 †
Pygmées, Les, Négrilles d'Afrique, par M. le Roy, 227 †
Rubber plants, Herr Schlechter's study of, 445
South: Bibliography, etc., relating to, by H. S. Hollway, 338 †; Books and Maps on, 563; On the South African Frontier, by W. H. Brown, 582 †; Dr. Passarge's Journeys in, 310; Further Correspondence relative to the Affairs of Swaziland, 228 †; Invasion des Zoulous dans le Sud-Est Africain, par A. Grandjean, 228 †; Geodetic Survey of, 667; British and Dutch in, by H. A. Bryden, 682 †
South African Republic (*see also* Transvaal), Papers relating to the Complaints of British Subjects, 338 †
Trade and Shipping of, 117 †
Trans-afrikanische Eisenbahn, 226 †
Under the African Sun, by W. J. Ansorge, 117 †
Une étude inédite de Stanley, 680 †
Voulet-Chanoine, Mission, 459 †
Africa—*continued.*
West Coast, cable fractures off, 401; Portuguese Discoveries on, 665
Agostini, G. de, Il lago del Matese, 111 †; on Bathymetrical Observations in the Italian Lakes, 441
Air—
Exploration of Free Air by Means of Kites, etc., by A. L. Rotch, 345 †
Use of Kites in the Exploration of the Upper Air, by C. F. Marvin, 345 †
Alaska—
Alaska and the Klondike, by A. Heilprin, 583 †
Alaska-Grenzfrage, zwischen England und der Vereinigten Staaten, 583 †
American expeditions to, 322
Boundary Question, The Alaskan, by H. Townsend, 682 †
Glaciers of South-Eastern Alaska and Notes on, by O. J. Klotz, 523 *
Goldfields of, Reconnaissance of the, by G. F. Becker, 339 †
Shishaldin as a Field for Exploration, by J. Stanley-Brown, 583 †
Yukon Gold District, Geology of the, by J. E. Spurr and H. Goodrich, 339 †
Albania and the Albanians in 1898, by Rev. H. Callan, 578 †
Albatross exploring expedition in the Pacific Ocean, 215
Albert Edward Nyanza, Mr. Sharpe's explorations at, 662
Alberto, G., Descobrimento das Filippinas pelo navegador Portuguez Fernão de Magalhães, 466 †
Album Géographique, par MM. Dubois et Guy, 236 †
Aleutian Islands, Volcanoes of the, Mr. Stanley-Brown on, 567
Algeria—
Aurès, Notes sur l', par M. Besnier, 336 †
Excursion à Bou-Saada et M'Sila, par de Galland, 680 †
Foureau-Lamy Mission, La marche de la, 336, 680 †
France dans le sud Algérien, par G. Mercier, 680 †
Pénétration du Sahara par l'Algérie, par L. Krzyzanowski, 336 †
Trade of (Foreign Office Rep.), 680 †
Western Erg of, 336 †
Algué, P. J., Baguios ó Ciclones Filipinos, 335 †
Allah-bund in the north-west of the Rann of Kuchh, A Note on the, by R. D. Oldham, 458 †
Almer, Christian, by W. A. B. Coolidge, 689 †
Alpine District—
La regione alpina, by Colonel Giannitrapani, 111 †
Alps—
Eastern, Baedeker's Handbook for Travellers, 674 †

Alps—*continued.*
Flora of the, by Prof. A. W. Bennett, 674 †
Glaciers of the, 316
Grundlinien der Struktur der Ostalpen, von Dr. C. Diener, 674 †
Hints . . . for Travellers in the, by the late John Ball, 109 †
Hours of Exercise in the, by J. Tyndall, 109 †
Morfometrici di alcuni laghi prealpini, pel Dr. G. Halbfass, 329 †
Préalpes Romandes, par H. Schardt, 109 †
Studi orografici nelle alpi orientali, del Prof. O. Marinelli, 109 †
Altai Mountains, On the Zoology and Botany of the, by H. J. Elwes, 216 †; note on, 204
Altitudes—
Sulla determinazione delle altitudini presso gli antichi, del Prof. Bertolini, 346 †
Altmann, Captain, map of King Charles Land, 70
Altmark—
Arendsee in der, von Dr. Halbfass, 577 †
Hopfenbau in der, von Dr. A. Mertens, 577 †
Altyn Tagh, Central Asia, 442
Amaru-mayu or Madre de Dios, 447
Amazon—
American War-ship on the, 567
Hautes régions des Amazones, par A. Viellerobe, 342 †
Italian Expedition to the Amazon valley, 213
Materiaes para a flora amazonica, pelo Dr. Huber, 462 †
Pays des Amazones, l'El-Dorado, les Terres à Caoutchouc, par Baron de Santa-Anna Nery, 585 †
Amboina, Der Wawani auf, von A. Wichmann, 225 †
Amdrup, Lieut., expedition to East Greenland, 449
America(n)—
American History and Geography, 228 †
Bay of Fundy Trough in American Geological History, by Prof. Bailey, 229 †
Central, Dr. Sapper on the Physical Geography of, 95
Commercial Directory of the American Republics, 229 †
Ephemeris and Nautical Almanac, 464 †
Fishes of North and Middle America, by Jordan and Evermann, 119 †
Geographical Society, Medal of, awarded to Sir John Murray, 105
Impressions of, by T. C. Porter, 461 †
Inter-oceanic Canal, Dr. Nimmo on the, 569; Prof. Johnson on the, 569
North: Select Bibliography on Travel in, by C. W. Plympton, 339 †
America—*continued.*
Some more discoverers of their predecessors' discoveries, by M. A. Shipley, 338 †
South: On two unclassified recent Vocabularies from, by D. G. Brinton, 121 †; The Vassalage of, by J. Frick, 121 †; Early explorations of, 241; Dr. Steffen's expedition in, 96; Letter from F. P. Moreno on Dr. Steffen's Exploration in, 219; Geographical progress in, 6; Sur le commerce du "caucho" dans l'Amerique du sud, par F. J. Hessel, 685 †
West Coast, Admiralty survey of, 84
Amerind—A Designation for the Aboriginal Tribes of the American Hemisphere, 346 †
Amorgos, L'île d', par H. Hauttecœur, 453 †
Amoy, Trade of (Foreign Office Rep.), 456 †
Anadyr, La province d', par A. Silnitzky, 116 †
Andamans—
Languages of the, by M. Portman, 114 †
Andean Cordillera, 244
Anderson, J. F., Sugar Industry of Mauritius, 118 †
Anderson, T., Vesuvius, a Note on the Eruption of September, 1898.. 223 †
Andes—
Alturas sobre el nivel del mar, por A. Raimondi, 684 †
Climbs in the, by Sir M. Conway, 584 †
Exploration in the Bolivian Andes, by Sir M. Conway, 14 *
Volcanic rock of the, 31
Andreasen, Captain, map of King Charles Land, 72
Andrée—
Ballon d'Andrée, Le, 686 †
Andrée search expedition under Dr. Nathorst, 97
Andrée's Route, letter from Mr. A. M. Brice on, 575
Angles—
Épreuves des instruments destinés aux expériences sur la decimalisation des angles, par M. Caspari, 343 †
Anglo-Jewish Association, Annual Report of, 347 †
Angola, New Railway for, 567; Southern Interior of, Dr. Baum's expedition, 665
Angoumois, Une paroisse autrefois en, par E. Vincent, 576 †
Anguilla, Report on Vital Statistics, 684 †
Anniversary Meeting of the R.G.S., 102; Dinner, 107
Annotaçoes historicas, de L. Cordeiro, 689 †
Ansorge, W. J., Under the African Sun, 117 †
Antarctic, The, 53
Antarctic—
Antarctic and Southern Exploration, by Hon. P. G. King, 343 †

Antarctic—*continued.*
Antarctic Climate, The, by H. Arçtowski, 686 †
Antarctic exploration, M. Arçtowski on, 547, 548
Bathymetrical Conditions of the Antarctic Regions, by H. Arçtowski, 77 *
Botanischen Ziele der Südpolar Forschung, von Dr. Neger, 343 †; note on, 448
Climate, The, by H. Arçtowski, 413 *
Deutsche Südpolar expedition, von Dr. Oberhummer, 231 †
Deutschen Tiefsee-Expedition, Hauptergebnisse der, von Dr. A. Supan, 231 †
Erklärung geographischer Namen aus der Südpolarwelt, von E. Oppermann, 231 †
Expédition Antarctique Belge, 231 †; 343 †; par M. de Gerlache, 686 †
Expedition, The National, Deputation to the Government, 190; Congratulations of the Adelaide Geographical Society, 203
Expeditions, The, by Sir C. Markham, 473 *; Progress of, 7, 439, 440; Gerlache's, 7; Borchgrevink's 8, 438
Ocean, temperatures of the, 39, 40, 45
Physical and Chemical work of an Antarctic Expedition, by J. Y. Buchanan, 552 *
Plans for Antarctic Exploration, 342 †; Plans for reaching the South Pole, by G. Grosvenor, 586 †
Spedizioni polari antartiche, by G. Pini, 586 †
Terra Australis Incognita, by Prof. Morris, 586 †
Through the First Antarctic Night, by Dr. F. Cook, 686 †
Treibeis in südlichen Breiten, von L. Dinklage, 586 †
Anthropogeographie, von Dr. F. Ratzel, 124 †
Anthropological Expedition to Torres Straits and Sarawak, 302; Anthropological Investigations . . . Children of the New York Juvenile Asylum, by Dr. A. Hrdlicka, 461 †
Antitaurus und in Cilicien, Chantres Reisen im, 226 †
Apenninského ku Balkánokému, Vztah poloostrova, by S. F. Nerad, 224 †
Apulia—
Sulla Plastica e la Geologia della Regione Pugliese, di C. Bertacchi, 331 †
Arabia—
Arabica, par le Comte de Landberg, 333 †
Expedition nach Süd-Arabien, von Dr. C. Graf Landberg, 224 †
Südarabische Expedition, von Dr. C. Graf. Landberg, 678 †
Südarabische Expedition . . . des Grafen Carlo Landberg, von Dr. Müller, 333 †
Aramaya, Señor, remarks on "Explorations in the Bolivian Andes," 31
Aräometer . . . im Atlantischen und im Stillen Ozean, von Dr. Krämer, 688 †
Arbo, C., Fortsatte Bidrag til Nordmændenes Anthropologi, 112 †
Arc of Meridian of Quito, Re-measurement of the, 323
Arctic—
A Thousand Days in the, by F. G. Jackson, 122 †
Currents, Drift-casks for the determination of, 326
Expeditions: Duke of Abruzzi's, 98; Nathorst's, 97, 448, 534; Peary's, 325, 448, 570; Wellman's, 326; Russian, proposed, 327; Sverdrup's, 448, 571; Stein's, 326, 571; Andrée's probable route, 575
In Nacht und Eis, von B. Nordahl und Lieut. Johansen, 231 †
La via al Polo Nord, Breve Critica della geografia fisica, 343 †
Swedish Arctic Expedition of 1898, by Prof. Nathorst, 51 *, 155 *, 686 †
Temperatures of the Arctic Ocean, 38, 40, 44
Arçtowski, H., The Antarctic Climate, 413 *, 686 †; The Bathymetrical Conditions of the Antarctic Regions, 77 *; on Antarctic exploration, 547, 548
Ardishai, Lake Urmi region, 507
Argentine—
Argentina, Il Distretto consolare di La Plata, del C. Nagar, 341 †
Missions Franciscaines du désert argentin, par Mme. Beek-Bernard, 120 †
Resultados Hipsométricos de algunos Viajes del Dr. Bodenbender, por O. Doering, 584 †
Territorial area of, 245
Argentine Chilean Boundary in the Puna of Atacama, 322
Argentino, Lake, 253, 260
Aridity in the Western United States, Increase of, Mr. Leiberg on, 212
Arizona—
Ausflug nach Tusayan (Arizona), von Dr. Ehrenreich, 683 †
Armenia—
Forschungsreise durch Armenien, von W. Belck und C. Lehmann, 224 †
Reisebriefe von der Armenischen Expedition, von Drs. Belck und Lehmann, 113 †
Armitage, A., award to, 103
Armstrong, Sir A., obituary of, 217
Arzu island, Lake Urmi, 514
Asia—
All-British Railway to China, by C. A. Moreing, 678 †
Barren der Danduschka, von W. R. Rickmers, 582 †
Britischen und französischen Besitzungen in Vorder- und Hinterindien, von H. Wagner, 225 †

Asia—*continued.*
Central : Reise durch Central-Asien und China, von Drs. Futterer und Holderer, 114 †; M. Dutreuil de Rhins in, letter from M. Grenard on, 328; Dutreuil de Rhins' Mission in, Final Results, 442; Meteorologische Beobachtungen in Luktschun, Zentralasien, von Dr. Friederichsen, 581 †; Dr. Sven Hedin's work in, 90
Durch Asiens Wüsten, von Sven Hedin, 225 †
East: Reise des Grafen Bela Széchenyi in Ostasien, 114 †; Wirthschaftsverhältnisse Ostasiens, von A. Wiesenburg, 114 †
Geographischen Forschungen und Reisen in 1898, von Dr. Jüttner, 678 †
Heart of Asia, The, by Skrine and Ross, 336 †; note on, 560
Highway of the Nations, etc., by Colonel Mark Bell, 678 †
Maps: Carte de l'Asie Centrale, et Carte Ethnographique et Politique de l'Asie Centrale, par F. Grenard, 238
Mission Scientifique dans la Haute Asie, par M. Dutreuil de Rhins, 225 †
Reiseskizzen aus Transkaspien, von G. Boehm, 336 †
Vom Mittelmeer zum Persischen Golf, von Dr. Oppenheim, 117 †
Asia Minor—
Asie Mineure au point de vue de l'emigration allemande, par Dr. Oehlmann, 579 †
Aus Kleinasien, von Dr. Escherich, 226 †
Chemin de fer projeté entre la Méditerranée et le Golfe Persique, par M. Morel, 113 †
Maps: Archäologische Karte von Kleinasien, von Drs. Ruge and Friedrich, 348
Assam—
Mikir Hills in Assam, Geology of, by F. H. Smith, 458 †
Trade between Assam and adjoining Foreign Countries, Report on, by L. J. Kershaw, 458 †
Astronomie und Geophysik, Jahrbuch der, von Dr. Klein, 234 †
Atacama—
Erzlagerstätten der Atacamawüste, von G. Nordenskjöld, 684 †
Atlantic—
Eastern Margin of the North Atlantic Basin, Mr Hudleston on, 327
Pilot charts, 128, 239, 469
South, cold bottom water of the, 553
Temperatures of the, 38, 40, 44
Atlases—
Atlas Melin, par A. Paris, 127
Atlas Universel de Géographie, par MM Vivien de Saint Martin et Schrader, 239, 349
Bartholomew's Physical Atlas, vol. iii.
Atlases—*continued.*
Atlas of Meteorology, 590; Review on, by Dr. H. R. Mill, 649
Historical Atlas of Modern Europe, by R. L. Poole, 126, 468
Meyer's Hand Atlas, 239, 349, 469, 591, 695
Atmosphere—
Circulation of the, by Prof. W. M. Davis, 586 †
Explorations of the Upper Atmosphere, by H. de Graffigny, 345 †
Atmospheric and Oceanic Currents—
Ueber einen hydrodynamischen . . . Mechanik der Atmosphäre und des Weltmeeres, von V. Bjerknes, 687 †
Atmospheric gases dissolved in sea-water, Determination of, 554
Atmospheric Tides—
Écarts barométriques sur le méridien du Soleil, etc., par M. Poincaré, 687 †
Auk Horn, Spitsbergen, 64
Aurora—
Ueber . . . Periode der Polarlichter und Gewitter, von N. Ekholm und S. Arrhenius, 687 †
Austin, Major, From Njemps to Marich, Save, and Mumia's, 307; Lake Rudolf, 148 *
Austin, O. P., The Commercial Development of Japan, 580 †; The Commercial Importance of Samoa, 464 †
Australasia—
Edwards's Australasian Catalogue, by Mr. Petherick, 231 †
Mineral Waters of, Composition and Properties of the, 342 †
Seven Colonies of, Statistical Account of, by T. A. Coghlan, 342 †
Seismological Phenomena in, 342 †
Australia—
Artesian areas of, 408
Au travers du Continent Australien, par Captain Vere Barclay, 342 †
Central Australia, remarks on, by W. H. Tietkens, 463 †
Contribution to Australian Oceanography, by T. W. Fowler, 463 †
Coolgardie Gold Fields, Geology of, by T. Blatchford, 586 †
Discovery of, The Part borne by the Dutch in the, by J. E. Heeres, 585 †, 685 †
Divisional Systems, by R. H. Mathews, 685 †
Eaglehawk and Crow, a study of the Australian Aborigines, by J. Mathew, 685 †
Federation of, 685 †
Maps: Reduced Survey of, by J. Bartholomew, 127; Remarkable Maps of the Fifteenth and Sixteenth Centuries, by F. Muller, 127
South: Tides of, by R. Chapman and Captain Inglis, 586 †; South Australia as a Federal Unit, by Hon. J. Cockburn, 122 †

Australia—*continued.*
Was Australia discovered in the Sixteenth Century? by E. Heawood, 421 *; letter from Mr. Edmond on, 574
Western: Geology of the Coolgardie Goldfield, by T. Blatchford, 586 †; Botanical Results of Journey into Interior of, by S. Moore, 586 †; Western Australia, its Position and Prospects, by T. Chambers, 342 †
Year Book of, for 1893, by Hon. E. Greville, 231 †
Austria—
Meteorologie und Erdmagnetismus, Jahrbucher, 110 †, 576 †
Pflege der Erdkunde in Oesterreich, 110 †
Siebenter Jahres-Bericht des Sonnblick-Vereines, 329 †
Stehende Seespiegelschwankungen auf dem Traunsee, von Dr. Richter, 110 †
Austria-Hungary—
Dreiecksnetz erster, Ordnung der österreichisch ungarischen Monarchie, von R. v. Sterneck, 221 †
Neueren Arbeiten der Mappierungs-Gruppe, von C. R. v. Steeb, 222 †
Aymara Indians, Bolivia, 20
Azerbaijan, plateau of, 504; Trade of (Foreign Office Ann.), 581 †
Azores—
Carte bathymétrique de l'archipel des Açores, Note de M. Thoulet, 329 †
Azurara's 'Chronicle of the Discovery of Guinea,' edited by C. R. Beazley, 665, 666

B.

Baden—
Veränderungen der Volksdichte im nördlichen Baden, von Dr. K. Uhlig, 222 †; note on, 89
Baedeker, K., Handbook for Travellers, The Eastern Alps, 674 †; Norway, Sweden, and Denmark, Handbook for travellers, 224 †
Bafum country and tribe, 633, 634
Bahia
Descoberta das Lavras Diamantinas na Bahia, pelo G. Pereira, 462 †
Descripção da Bahia de Todos os Santos, por S. de Vasconcellos, 462 †
O Dique da Bahia, pelo Dr. da Silva Lima, 462 †
Riqueza mineral do Estado da Bahia, por H. Praguer, 462 †
Trade of (Foreign Office Rep.), 462 †
Baikal, Lake, Trans-Siberian Railway at, 317
Bailey, F. M., Notes on the Vegetation of New Guinea, 463 †, 585 †
Bain, R. N., Finland and the Tsar, 112 †
Baker, M. S., Lava Region of Northern California, 683 †
Baker, Rio, Chili, 96, 219
Balaton, Lake—
Resultate der wissenschaftlichen Erforschung des Balatonsees, Die Fauna, 111 †, 454 †
Balfour, Mr. A. J., remarks on the National Antarctic Expedition, 199
Baljuan, Bokhara, 602
Balkan Peninsula—
Ethnographie der Balkanhalbinsel, von R. v. Mach, 329 †
Maps: Karte der Schulsphären der türkischen Balkan-Halbinsel, von R. von Mach, 126
Ball, John, Hints . . . for Travellers in the Alps, 109 †
Balloons—
Ergebnisse der internationalen Ballonfahrten, von H. Hergesell, 124 †
Sur un voyage aérien de longue durée, de M. G. Hermite, 689 †
Balmaceda lake, 254
Baltic—
Les bruyères préhistoriques des pays baltiques, 676 †
Baltic Islands
Chalk and Drift in Moen and Rügen, Relations of, by Prof. Bonney and Rev. G. Hill, 674 †
Baltic Sea—
Physikalischen . . . Eigenthümlichkeiten der Ostsee, von Prof. Rein, 674 †
Baluchistan, British, Photographs of, by G. P. Tate, 352
Bandelier, Mr., work of, in Bolivia, 23
Bandiagara range, Sudan, 320
Bangweulu region, Mr. Weatherley's surveys in the, 319, 561
Banpara, Ein Ausflug nach, von S. E. Peal, 114 †
Barbadoes, Annual Report (Col. Reports), 684 †
Barbier, J. V. (Biography), par Ch. Pfister, 124 †
Barclay, Capitaine, Au travers du continent australien, 342 †; Mission à l'île de Pâques, 342 †
Barnes, H. T., On some Measurements of the Temperature of the Lachine Rapids, 229 †, 345 †
Baro-cyclo-nometer, the, 465 †
Barometric Methods, Determination of Heights by, by T. W. Fowler, 343 †
Barometric pressure, tables of, in the antarctic, 418
Ba-Rotse, Au, par E. Béguin, 117 †
Barré, H., Les Colonies Portugaises, 237 †
Barré, O., La Géographie Militaire et les nouvelles méthodes géographiques, 110 †; note on, 672
Barré, P., La Belgique maritime, 576 †; Les États-Unis d'Amérique et leur extension en 1899, 461 †
Barrett, Hon. J., Siam and its Neighbours, 582 †
Barrett-Hamilton, G. E. H., Glimpses of

Life in the Far North-East, 335 †; Kamchatka, 226 †
Bartholomew, J.—
Cyclists' Road-map of Glasgow District, 468
Physical Atlas, vol. iii. Atlas of Meteorology, 590; Review on, by Dr. H. R. Mill, 649
Reduced Ordnance Survey of England and Wales, 238, 347, 692
Reduced Survey Map of Australia, 127
Baschin, O., Bibliotheca Geographica, 690 †
Bassama tribe, Benue region, 631
Bathurst, The Gold-diggings at, by Mrs. Huxley, 342 †
Bathymètre fondé sur l'emploi de cylindres crushers, sur un, par MM. Charbonnier et Galy-Aché, 587 †
Bathymetrical Conditions of the Antarctic Regions, by H. Arçtowski, 77 *; Bathymetrical Observations in the Italian Lakes, by Dr. G. de Agostini, 441
Battermann, Dr., Resultate aus den Polhohenbestimmungen in Berlin, 344 †
Battisti, C., Gli studi limnologici italiani, 111 †
Batum and District, Trade of (Foreign Office Rep.), 335 †
Bauchi, Kingdom of, Notes on a Journey to Pali and Mamaidi in, by P. A. Clive, 177 *; Lieut. Bryan's journey to, 447
Bauer, L. A., The Magnetic Work of the United States Coast and Geodetic Survey, 461 †; Earth-air Electric Currents, 588 †
Baum, Dr., Expedition in the Southern Interior of Angola, 665
Baumann, Dr. O., Die Insel Pemba und ihre kleinen Nachbarinseln, 458 †; obituary of, 574
Bavaria—
Entwicklung und die Aufgaben der bayerischen Landeskunde, von Dr. E. Oberhummer, 453 †
Baye, B. de, Au sud de la chaîne du Caucase, 335 †; Au nord de la chaîne du Caucase, 680 †
Beach Cusps, by Mark Jefferson, 232 †
Beadnell, C. M., On the Decline of Scurvy afloat, 589 †
Bear Island, Arctic ocean, 55–59; letter from Sir Martin Conway on, 328; Några upplysningar till den nya Kartan öfver Beeren Eiland, af A. Nathorst, 464 †
Bear, W. E., Flower and fruit-farming in England, 224 †
Beatus group of early maps, 621–629
Beazley, C. R., Azurara's 'Chronicle of the Discovery of Guinea,' edited by, 665, 666; New Light on some Mediæval Maps, 620 *
Bechuanaland Railway, Correspondence with Mr. C. Rhodes relating to the, 458 †
Beek-Bernard, Mme., Missions Franciscaines du désert argentin, 120 †
Begg, A., Early Exploration in North-West Canada, 461 †; Vancouver Island, 583 †
Béguin, E., Au Ba-Rotse, 117 †
Béhagle, Mission de Haut-Oubangui, 459 †; mission to Lake Chad, 320
Beira, Trade of (Foreign Office Rep.), 118 †
Beirut and Coast of Syria, Trade of (Foreign Office Rep.), 582 †
Belck und Lehmann, Drs., Reisebriefe von der Armenischen Expedition, 113 †
Belgium—
Antarctic Expedition, 231 †, 77
Belgique Maritime, par P. Barré, 576 †
Bruges Ship Canal, by L. F. Vernon-Harcourt, 330 †
Climat de la Belgique en 1897, par A. Lancaster, 330 †
Intérêt des relevés journaliers des heures de Soleil, par A. Lancaster, 452 †
Observations météorologiques faites à l'Observatoire Royal de Belgique, 452 †
Vallon des Chaudières, par Ed. Rahir, 330 †
Belgrano river and mount, 266; Lake, 259, 265
Bell, Colonel Mark, The Highway of the Nations, 678 †
Bell, R., Rising of the Land around Hudson Bay, 229 †
Bellagamba, G., Sull' influenza . . . della componente orizzontale del magnetismo terrestre, 588 †
Bellet, A., La Pêche de la morue sur le grand banc de Terre-Neuve, 461 †
Bellett, D., La valeur économique de Samoa, 464 †
Benest, H., Submarine Gullies, etc., beneath the Sea-level, 394 †
Benguella, Estudios dos planalto do districto de, por A. de Andrade, 682 †
Benue, Regions of the, by L. H. Moseley, 630 †
Beresford, Lord Charles, The Break-Up of China, etc., 334 †
Berg, Prof. C., Anales del Museo Nacional de Buenos Aires, 341 †
Bergholz, Dr., Die Taifune vom Sept., 1897..114 †
Berlin—
Die Stadt, Festschrift der Stadtgemeinde, 675; Umgebungen, Handbuch für reisende, von Dr. K. Baedeker, 675 †
Geographen-Kongress, 1899, Programm der Wissenschaftlichen Ausflüge, 86, 453 †
Maps: Geologische Uebersichtskarte von, 691; Neuer Verkehrs-Plan von Gross-Berlin, von G. Müller, 691
Seventh International Geographical Congress at, Proceedings of, 537–545; Resolutions of, 543; Plan of Excursions, 86
Bernard, A., La Question du Transsaharien, 337 †

Berry, J., Proceedings of the Convention of Weather Bureau Officials, 465 †
Bertacchi, C., Geografi italiani all' estero, 237 †
Bertaux, E., Étude d'un type d'habitation primitive, 346 †
Berthaut, Colonel, La Carte de France 1750–1898, Étude historique, 222 †
Bertolini, Prof., Sulla determinazione delle altitudini presso gli antichi, 346 †
Bez au Daghi, Lake Urmi region, 511
Bezold, W. von, Ueber die Zunahme der Blitzgefahr, 233 †
Bhagavata Purana, Topographical List of the, by Rev. J. Abbott, 335 †
Bibliography—
Bibliographie Géographique annuelle, 589 †
Geographical Works published in the United States, by J. M. Boutwell, 466 †
Index to Subject Bibliographies, by A. Newman, 236 †
Katalog der Bibliothek der deutschen Akademie der Naturforscher, von O. Grulich, 236 †
Bibliotheca Geographica, von O. Baschin, 690 †
Bilbao and District, Trade of (Foreign Office Rep.), 577 †
Binger, M., Founders' medal awarded to, 102
Biography, Dictionary of National, by Sidney Lee, 124 †
Bion, W. A., Notes on the Meteorology of Vizagapatam, 115 †
Biscay, Bay of—
Pêche du thon dans le golfe de Gascogne, par MM. Odin et Rabilier, 453 †
Bismarck-Archipel und die Salomons-Inseln, von Dr. Hahl, 463 †
Bjerknes, V., Ueber . . . die Mechanik der Atmosphäre und des Weltmeeres, 687 †
Black, W. G., Ocean Rainfall by Rain-Gauge Observations at Sea, 465 †
Blackwater Fever, by W. H. Crosse, 236 †
Bladen, F. M., Historical Records of New South Wales, 585 †
Blatchford, T., The Geology of the Coolgardie Goldfields, 586 †; and E. Allhusen, Geological Map of Coolgardie, 695
Blazac, M., on the geography of Nemensha country, 208
Bliss, F. J., First Report on the Excavations at Tell Zakarîya, 116 †
Blondiaux, Lieut., explorations on the Ivory Coast, 210; Le Boucle du Niger, 118 †
Blumentritt, F., Die Filipinos als Herren im eigenen Hause, 226 †
Boas, F., Daniel G. Brinton, 689 †
Boehm, G., Reiseskizzen aus Transkaspien, 336 †
Boer Republics, 'Daily Mail' Map of the, 694
Bohemia—
Deutsch-tschechische Sprachgrenze in Nordböhmen, von P. Langhans, 674 †
Bohlin, K., Ueber eine sonderbare . . . beobachtete Nordlichterscheinung, 344 †
Böhm, Dr. A., Zur Erinnerung an Franz von Hauer, 235 †; Zur Biographie Friedrich Simony's, 347 †
Boillet, L., Aux Mines d'Or du Klondyke, 339 †
Bokhara, Travels in, by W. R. Rickmers, 596 *
Bolivia—
Einige Wochen auf der bolivianischen Puna, von C. Nusser-Asport, 684 †
Bolivian Andes, Exploration in the, by Sir M. Conway, 14 *, 341 †
Bolivian-Chilean boundary, 322
Bonin, M., journey in China, 206
Bonin et Grenard, MM., Les derniers voyages dans le Tibet Oriental, 457 †
Bonney, Prof., remarks on "Explorations in the Bolivian Andes," 31: and Rev. E. Hill, Relations of the Chalk and Drift in Möen and Rügen, 674 †
Bonola, Dr. F., Le Musée de Géographie et d'Ethnographie, 236 †
Boraston, J. M., Brazil in 1898 .. 584 †
Borchgrevink, Mr., expedition to the Antarctic, 9, 438
Bordeaux and District, Trade of, 453 †
Borg, V., Fysillis-maantieteellisiä tutkimuksia Kalvolan pitäjässä, 331 †
Borneo—
British North Borneo, by Sir J. Jardine, 115 †
Geologie van het Stroomgebied der Kapoeas-rivier, door N. W. Easton, 679 †
Bornholm, von Dr. Buschan, 576 †; Bilder von, von J. Gebeschus, 675 †
Bosnia—
Jajec, die alte Konigsstadt Bosniens, von Dr. Bräss, 329 †
Botanical Aims of South Polar Research, Dr. Neger on, 448
Bothnia—
Senkvartära Landhöjningen kring Bottniska Viken, af G. de Geer, 676 †
Botletli river, South Africa, 311
Boultbee, J. W., Artesian Water in New South Wales, 686 †
Bourdarie, P., La Colonisation du Congo Français, 118 †
Bourinot, J. G., Canada during the Victorian Era, 119 †
Bourne, H. R. F., The Uganda Protectorate and its Relation to the Sudan, 119 †
Boutwell, J. M., Bibliography of Geographical Works published in the United States, 466 †
Bouvet Island: Wiederauffindung der Bouvet-Insel, von W. Sachse, 458 †
Bonysson, J., Renseignements sur la région côtière au nord de Libreville, 118 †

Bradley, C. B., Exploration of the East Creek Amphitheatre, 120 †
Brady, —, Trade of Kiukiang, 457 †
Brady glacier, Alaska, 533, 673
Bramabiau subterranean river, 405
Brătianu, Gen., Trebuinta de a se face cadastrul Româniel, 455 †
Bray, F. de, Enterprises en Chine, 456 †
Brazil—
As exploraôçes do Sr. Apolinario Frot, 121 †
Bahnen Neu-Hamburg-Torres, 584 †
Brazil in 1898, by J. M. Boraston, 584 †
Considérations économiques sur le Brésil, par L. F. Viala, 121 †
Franco-Brazilian contested territory, M. Brousseau on, 212
Materiaes para a flora amazonica, pelo Dr. J. Huber, 462 †
Meyer, Dr. Hermann, journey in, 324; über seine zweite Reise in Central-Bresilien, 341 †
Nouvelle Pologne, état de Paraná, par J. de Siemiradzki, 462 †
Trabalhos restantes ineditos da Commissão Geologica do Brazil, 462 †
Voyage entre Tocantins et Xingú, par H. Coudreau, 230 †
Brenier, H., report on Lyons Commercial Mission in China, Review on, 652
Bretschneider, E., History of European Botanical Discoveries in China, Review on, 654
Brewer, W. M., Prospecting in British Columbia, 228 †
Brice, A. M., letter from, on Andrée's route, 575
Brigham, Prof. A P., The Eastern Gateway of the United States, 340; Physical Geography in Secondary Schools, 467 †
Brinton, Daniel G. (Biography of), by W. J. M., and Franz Boas, 689 †; On two unclassified recent Vocabularies from South America, 121 †
Brisbane River, Floods in the, by C. J. R. Williams, 464 †
British and Dutch in South Africa, by H. A. Bryden, 682 †
British Association, Dover, Proceedings of, 546; Address to Geographical Section of the, by Sir J. Murray, 688 †
British Colonies—
Colonies Anglaises, Les, par G. Chevilliard, 236 †
Colonies and the Century, by Hon. Sir J. Robinson, 236 †
Kolonialpolitik Grossbritanniens, von Dr. A. Zimmermann, 124 †
British Columbia—
Illecellewaet and Asulkan Glaciers of, by G. and W. Vaux, 683 †
Prospecting in, by W. M. Brewer, 228 †
Squamish Indians of, Notes on, by Prof. Hill-Tout, 119 †
British Empire—
Etappenstrasse von England nach Indien, etc., von C. Wachs, 690 †
Queen's Empire, The, 236 †
British Isles: *see* United Kingdom
British Mountain Tops, Winter Minima on, 113 †; note on, 315
British New Guinea—
British New Guinea, by Sir W. Macgregor, 231 †; ditto, Annual Report, by Sir W. Macgregor, 231 †; Despatch . . . reporting Visit of Inspection, 231 †
Brittany, Prehistoric Monuments of, by Prof. Macallum, 330 †
Brose, M., Die deutsche Koloniallitteratur, 467 †
Brousseau, M., on the Franco-Brazilian contested Territory, 213
Brown Coal Mining in the Rhineland, 110 †
Brown, Major, The Land of Goshen and the Exodus, 117 †
Brown, P., Temperature Records on British Mountain-tops, 315
Brown, T. F., Our Coal Supplies, 113 †
Brown, W. H., On the South African Frontier, 582 †
Bruges Ship Canal, etc., by L. F. Vernon-Harcourt, 674 †
Bryan, Lieut., journey to Bauchi, in Nigeria, 447
Buchan, Dr. A., Tidal Currents of the North Sea, 588 †
Buchanan, J. Y., On the Physical and Chemical Work of an Antarctic Expedition, 552 *
Buchs, V., Voyages en Abyssinie, 117 †
Buckman, S. S., The Development of Rivers, etc., 113 †; on the Genesis of the Severn, 88
Budapest—
Statistisches Jahrbuch, von Dr. G. Thirring, 111 †
Buenos Aires, Lake, Patagonia, 354
Buenos Aires—
Anales del Museo Nacional de Buenos Aires, por Prof. C. Berg, 341 †
Annuaire Statistique de la Ville de Buénos-Ayres, 684 †
Anuario de la Dirección General de Estadistica, 684 †
" Bureau Démographique " at, 669
Bukowski, G. von, Geologische Uebersichtskarte der Insel Rhodus, 455 †
Bulatovitch, M., explorations south of Abyssinia, 664
Bulgaria—
Sources et Pertes des Eaux en Bulgarie, par MM. Scorpil, 110 †
Bullock, T. L., Intercourse in the Past between China and Foreign Countries, 456 †
Bulugebietes, nördlichen, Begleitworte zu der Karte des, von Max Moisel, 460 †
Bumba river, Congo basin, 445

Bundooism, Modern, in Pagan Africa, by Rev. F. Snelson, 458 †
Buner, Ancient Topography of, Dr. Stein on, 660
Bure, P., Tientsin, 579 †
"Bureau Démographique" at Buenos Aires, 669
Burls, H. T., Ascent of Mount Kinabulu, 207
Burma—
Myingyan, etc., Districts in Burma, Geology of Parts of the, by G. Grimes, 458 †
Third Burmese War, by Major Keene, 115 †
Burma-China Boundary Commission surveys, 314
Burton's Pilgrimage to Mecca, 334 †
Buscalione, Dr., expedition to the Amazon Valley, 213
Buschan, Dr., Bornholm, 576 †

C.

Cable fractures, cause of, 394
Cabot—
Cabot Celebration at Halifax, 235 †
Cabotian Discovery, The, by J. B. Thacker, 235 †
Cabots, The, Notes on Certain Papers contributed to the Transactions of this Society, by H. Harrisse, 466 †
Voyages of the Cabots, by S. E. Dawson, 235 †
Cacaaca, Mount, Bolivia, 18, 21
Cadiz, Consular District of, Trade of (Foreign Office Rep.), 577 †
Calcutta, The Port of, by Sir C. Stevens, 334 †
California—
Denudation of Vegetation. Observations on the, by M. Manson, 683 †
Gully formation at Salinas landing, 412
Northern, Lava Region of, by M. S. Baker, 683 †
Southern California, by J. F. Chamberlain, 461 †
Cambridge—
Anthropological Expedition to Torres Straits and Sarawak, 302
Geography at, Mr. Yule Oldham's report on, 88
Cameroons: *see* Kamerun
Campbell, J., Origin of the Haidahs of the Queen Charlotte Islands, 119 †
Campbell, W. D., Aboriginal Carvings of Port Jackson and Broken Bay, 463 †
Canada—
Barren Lands of, Natural Resources, by J. B. Tyrrell, 119 †
Canada during the Victorian Era, by J. G. Bourinot, 119 †
De Carlton-House au Fort Pitt, par E. Petitot, 119 †
Entdeckungsgeschichte Canadas und seiner Grenzgebiete, von Dr. Nederkorn, 338 †
Canada—*continued.*
Ethnological Survey of, 228 †
Geographic Board of, 668
Geological Survey of, Annual Report, 229 †; Summary Report, 119 †
Interior, Department of the, Annual Report, 228
Laurentian highlands of, 482
Maps: General Map of North-Western Part of (Surveyor-General), 469; Geological Survey of, by G. M. Dawson, 126; Sectional Maps (Top. Surveys Branch), 349, 695
North-West, Early Exploration in, by A. Begg, 461 †
North-Western Tribes of, 339 †
Rocky Mountains of, Type of Lake Formation in the, by W. D. Wilcox, 339 †; Exploration in the, by Prof. Norman Collie, 119 †, 461 †; letter on, 101
Tides and Currents in Canadian Waters, Survey of, by W. Bell Dawson, 461 †
Up the Mackenzie River to the Polar Sea, by Miss E. Taylor, 119 †
Canadian International boundary work in Alaska, 523
Canal, American Inter-Oceanic, Dr. Nimmo and Prof. Johnson on the, 569, 685 †
Canary Islands, Trade of (Foreign Office Rep.), 458 †
Canton—
Trade of (Foreign Office Rep.), 678 †
Voyage de l'Ambassade Hollandaise de 1656 à travers la Province de Canton, par C. Huart, 456 †
Cap Breton, Fosse de, 406
Cape Cod District, Reservoirs of the, by N. S. Shaler, 340 †
Cape of Good Hope, Department of Agriculture, Annual Report of the Geological Commission, 117 †
Cape Verde Islands—
Dalle Isole del Capo Verde, del L. Fea, 117 †, 582 †
Capenny, S., The Khedivic Possessions in the Basin of the Upper Ubangi, 336 †
Carey, F. W., A trip to the Chinese Shan States, 378 *
Carli, M., La baia di San-men, 114 †; Il Ce-kiang, Review on, 655
Carnegie, D. W., award to, 103, 104
Carolina, North, Slavery in the State of, by J. S. Bassett, 684 †
Caroline Islands—
Cession of, to Germany, 97
Die Karolinen, von H. Singer, 585 †
Landeskunde der Karolinen, Umrisse zu einer, von Dr. A. Kirchhoff, 585 †
Carpenter, Captain, The West Indian Hurricane, 230 †
Carranza, Dr. L., pol Dr. C. Chacaltaua, 689 †
Carren-leufu river, 360

Cartography—
Leitfaden der Kartenentwurfslehre, von Dr. Zöppritz, 122 †
Technik der Kartenerzeugung, von Freiherrn von Hübl, 232 †
Carus, Prof. J. V., On the International Catalogue of Scientific Literature of the Royal Society, 466 †
Caspian—
Karabugas-Meerbusen des Kaspischen Meeres, von N. v. Seidlitz, 581 †
Castro, Dr. L. de, De Zeilah au Harar, 583 †
Catalogues—
Catalogue de la Bibliothèque de feu le Dr. Veth, 466 †
International Catalogue of Scientific Literature, by C. Adler, 466 †; by Prof. Carus, 466 †; Geology and Geography in, by Prof. Shaler, 467 †
Société Géographie de Lille, Catalogue de la Bibliothèque, 690 †
Cattolica, P. L., Stazione Astronomica a San Cataldo di Bari, 464 †
Caucasus—
Au nord de la chaîne du Caucase, par Baron de Baye, 680 †
Au sud de la chaîne du Caucase, par Baron de Baye, 335 †
Explorations in the, M. de Déchy's, 660
Hydrography of the, by V. Dingelstedt, 335 †
Photographs of, by M. de Déchy, 469
Tsiteli, First Ascent of, by C. T. Dent, 226 †
Uschba im Kaukasus, von W. Rickmer-Rickmers, 116 †
Causses, subterranean rivers in the, 404
Caves of Yorkshire, Mr. Cuttriss on the, 658
Celebes—
De adoptie in verband met het matriarchaat bij de Toradja's von Midden-Celebes, door A. C. Kruijt, 580 †
Census, Twelfth, of the United States, 322
Centrosphere, Solidity of the, 435, 436
Cerigo Island—
Originalkarte du Insel Kythera, von Dr. Leonhard, 126
Ceylon—
Administration Reports, by F. H. Grinlinton, 678 †
Botany of the Ceylon Patanas, by H. W. Pearson, 456 †
Dutch East India Company in, Monumental remains of, by F. H. de Vos, 678 †
Land Legislation in, Correspondence relating to, 456 †
Note sur le plus ancien entrepôt de commerce, par J. Leclercq, 678 †
Chablais, L'origine du, par M. Lugeon, 222 †
Chacaltana, Dr. C. (Biography of), Dr. L. Carranza, 689 †
Chad, Lake, M. de Béhagle's Mission to, 320
Chaix, E. (Biography of), Dr. E. Dufresne, 124 †
Chalmers, R., Report on Surface Geology . . . of Quebec, 683 †
Chamberlain, J. F., Southern California, 461 †
Chamberlin, Prof., Lord Kelvin's Address on the Age of the Earth as an Abode fitted for Life, 465 †
Chambers, T., Western Australia, its Position and Prospects, 342 †
Chambezi river, Central Africa, 444
Chamonix and the Range of Mont Blanc, by E. Whymper, 577 †
Champex, Lac de, 677 †
Chanoine, Captain, Mission Voulet-Chanoine, 459 †; expedition in French Sudan, 320
Chantres Reisen im Antitaurus und in Cilicien, 226 †
Chapman, R., and Captain Inglis, The Tides of South Australia, 586 †
Charlottetown, Pictou, and St. Paul Island, Tide Tables for, 338 †
Charnay, D., Une excursion au Yémen, 224 †
Charters Towers Goldfields, Geological Map of, 127
Charts, New—
Admiralty, 127, 349, 591
Cancelled, 128, 350, 591
Corrected, 128, 350, 591
Meteorological Charts of the Southern Ocean, 695
Russian, 351, 695
United States Hydrographic, 128, 239, 469
Chefoo, Trade of (Foreign Office Rep.), 456†
Che-Kiang—
Il Ce-Kiang, por E. Pini, 678 †
Il Ce-Kiang, Studio geografico-economico dell Dott. M. Carli, 579 †; Review on, 655
Province du Tché-Kiang, par A. Fauvel, 678 †
Chemisch-geologische Tiefsee-Forschung, von Dr. Natterer, 345 †
Chen-yuan district, 641, 642
Chesil Beach Shingle, On the Grading of the, by V. Cornish, 578 †
Chevalier, M., on steam navigation on the Upper Yang-tse, 316
Chevilliard, G., Les Colonies Anglaises, 236 †
Chicago—
Pleistocene Features and Deposits of the Chicago Area, by Fr. Leverett, 584 †
Trade of Chicago and District (Foreign Office Rep.), 584 †
Chignecto Bay, Marsh and Lake Region at the Head of, by G. J. Trueman, 338 †
Chile—
Pisagua et Antofagasta, Notice sur le territoire compris entre, par R. Latrille, 585 †
Dr. Steffen's expedition in, 96
Chilean Boundaries, 322

China—
Admiralty Surveys on coasts of, 85
All-British Railway to, by C. A. Moreing, 678 †
Avvenire economico della Cina, dell P. Gribaudi, 456 †
Baia di San-Men, del M Carli, 114 †; Baie de San-Moun, La, 456 †
Bonin's, M., Journey in, 206
Books on, Recent, Review by G. G. Chisholm, 652
Break-Up of China, etc., by Lord Ch. Beresford, 334 †
Chemins de fer en Chine, par J. Servigny, 114 †; ditto, par J. de Marcillac, 457 †
China, by H. E. Gorst, 334 †, ditto, by Mrs. Little, 579 †
Diamants Chinois, par A. Fauvel, 579 †
En Chine La part de la France, 114 †
Entreprises en Chine, par F. de Bray, 456 †
European Botanical Discoveries in, History of, by E. Bretschneider, Review on, 654
Exchange of Notes between the United Kingdom and Russia with regard to their Railway Interests in, 456 †, 457 †
Geographical Notes, VI. Ma-it—Ma-iep-ung, by G. Schlegel, 334 †
Imperial Maritime Customs Medical Reports, 456 †; Returns of Trade, etc., 679 †
Intercourse in the Past between China and Foreign Countries, by T. Bullock, 456 †
Intimate China, by Mrs. A. Little, 334 †
Italia in Cina, by Prof. Ricchieri, 456 †; Italia e la Cina, Conferenza . . . dal Prof. Nocentini, 456 †
Kurze Zusammenfassung . . . meiner Reise in China, von E. von Cholnoky, 456 †
Lighthouses, etc., List of, 457 †
Lyonnaise, Mission, d'Exploration Commerciale en Chine, Review on, 652
Maps. China Inland Mission Map of, 126
Minkiang, A Travel along the, by Kinosuke, 334 †
Notice géographique . . sur le haut Fleuve Rouge, 114 †
Ostkuste Chinas, Meine Erlebnisse an der, von E. S. Fischer, 579 †
Portuguese Intercourse with China, Early, by C. A. Montalto de Jesus, 579 †
Prospect in Chinese Trade, The, by G. F. Scott Elliot, 456 †
Spheres of Interest and the Open Door, by R. S. Gundry, 334 †
Through China with a Camera, by J. Thomson, 114 †
Trade and Trade Reports, Returns of, 457 †
China Sea Directory, 457 †
Chinese and Burma Boundary Commission, 314
Chinese Shan States, A Trip to the, by F. W. Carey, 378 *
Ching chi, iron foundry works at, 644
Chinkiang, Trade of (Foreign Office Rep.), 678 †
Chinnampo Port, Korea, 561
Chisholm, G. G., Review on Recent books on China, 652
Chitichun Region, Notes on the Geological Structure of the, by Dr. C. Diener, 579 †
Choate, Mr., remarks on presenting American Medal to Sir John Murray, 104
Choga, Lake, Central Africa, 132
Cholnoky, E. de, Map of the Mouth of the Yang-tse-Kiang, 349
Chungking, Trade of (Foreign Office Rep.), 456 †
Church, Colonel, remarks on "Explorations in Patagonia," 376; remarks on "Explorations in the Bolivian Andes," 33
Church Missionary Society, Proceedings of the, 690 †
Clifford, H., Life in the Malay Peninsula, 580 †
Climate and Colonization, 346 †; Climate of the Antarctic, 413; Climate of the Congo, 459 †
Climatology
Anwendung . . . der medicinischen Klimatologie, von Dr. Polis, 687 †
Clive, P. A., Notes on a Journey to Pali and Mamaidi, 177 *
Clock-Rates and Barometric Pressure . . . at Mare Island Observatory, by Ensign E. Hayden, 464 †
Clouds—
Wave or Billow Clouds, by A. J. Henry, 465 †
Clozel, F. J., La Côte d'Ivoire, 459 †
Clutterbuck, W. J., Photographs of Great Luchu Island, 592
Coal—
Our Coal Supplies, by T. F. Brown, 113 †
Coal and iron smelting in Manchuria, 295, 296
Coal in district of Kwei-yang, 642
Cockburn, Hon. J. A., South Australia as a Federal Unit, 122 †
Cocos-Keeling and Christmas Islands, Report on (Col. Reports, Ann.), 115 †
Codrington, Mr., Expedition to Dr. Livingstone's Tree, 317, 444
Coello, Colonel, etc. (Biography of), par L. Drapeyron, 124 †
Coffee and Indiarubber Culture in Mexico, by M. Romero, note on, 94
Coghlan, J. A., A Statistical Account of the Seven Colonies of Australasia, 342 †
Collie, J. Norman, Climbing the Canadian Rocky Mountains, 119 †, Exploration in the Canadian Rockies, 461 †; letter from, on the Canadian Rockies, 101

Collingwood, W. G., and J. Stefansson, A Pilgrimage to the Saga-Steads of Iceland, 675 †
Collins, R. M., Early Explorations on the Logan, etc., 122 †
Colombia—
Glacial Phenomena of, by R. Blake White, 684 †
Ores of, by H. W. Nichols, 684 †
Colonies Anglaises, par G. Chevilliard, 236 †; Colonies and the Century, by Hon. Sir J. Robinson, 236 †; Colonies Portugaises, par H. Barré, 237 †; Kolonial-Handels, Adressbuch, 691 †
Colonizzazione e Conquista, dal Prof. Ricchieri, 346 †
Colorado—
Mining Industries of the Telluride Quadrangle, Report, by C. W. Purington, 683 †
Colour Code, On a Correct, by J. A. Harvie-Brown, 125 †
Commercial Geography of the British Isles, by A. J. Herbertson, 677 †
Como, Lake, depth of, 441
Congo—
Basin, Dr. Pleyn's Explorations in the, 444
Climat du Congo, Court aperçu du, par A. Lancaster, 459 †
Expeditions: M. Foureau's, 319, 565
French: Concessions au Congo Français, 118 †; Colonisation du Congo Français, par P. Bourdarie, 118 †; Renseignements sur la région côtière au nord de Libreville, par J. Bouysson, 118 †
Géologie du Congo Occidental, par J. Cornet, 681 †
Haut-Oubangui vers le Chari, du, par Captain Julien, 681 †
Lower, Progress of railway, 565; M. Droogman's map of, 565
Maps: Carte du Bas-Congo, par H. Droogmans, 694
Museum, Publications of the, 566
Negrès du Congo, Ma captivité chez les, par M. Besson, 582 †
Organisation du Congo français, 337 †
State: Age de la Pierre au Congo, par X. Stainier, 227 †; New railway project for the, 211
Trade Returns, Summary of (Foreign Office Rep.), 459 †
Continental and Oceanic Areas, Evolution of the, 434
Conway, Sir M., Climbs in the Andes, 584 †; Exploration in the Bolivian Andes, 14 *, 341 †; letter from, on Bear Island, 328; letter from, on the Advance and Retreat of Sea-ending Glaciers, 672
Cook, Dr. F., Through the First Antarctic Night, 686 †
Coolgardie, Geological Map of, by Blatchford and Allhusen, 695
Coolidge, W. A. B. (Biography of), Christian Almes, 689 †
Coote, C. H., obituary of, 99
Copeland, W., letter from, on Rhodesian Art, 101
Copenhagen—
Port-franc de Copenhague, par A. Ferrière, 576 †
Cordeiro, L., Annotaçoes historicas, 689 †
Cordillera of the Andes, 244 *et seq.*
Cordillera Real, Bolivia, 15; action of rivers in the, 16; mineral products of, 18; flora of, 20, 32; geology of, 31
Cordoba—
Alturas, Tomadas en la provincia de Córdoba, por O. Doering, 584 †
Soto á Villa Mercedes, por O. Doering, 584 †
Corkagniney, On an Ancient Settlement in the South-west of the Barony of, by R. A. S. Macalister, 333 †
Cornish, V., On the Grading of the Chesil Beach Shingle, 578 †
Coronas, Father, on the eruption of Mayon, 92
Corsica—
Corse, La, Étude anthropogéographique, par F. Ratzel, 453 †
Korsische Städte, von F. Ratzel, 577 †
Corunna, Trade of (Foreign Office Rep.), 113 †
Cosmogony: Nouvelle théorie cosmogonique, par A. Duponchel, 125 †
Costa, Cap. G. da, Gaza, 1897–1898..682 †
Cotton trade in the Shan States, 390
Coudreau, H., Voyage entre Tocantins et Xingú, 230 †
Cowles, H. C., Ecological Relations of the Vegetation on the Sand-Dunes of Lake Michigan, 683 †; note on, 668
Crammer, Prof. H., Eishöhlen- und Windröhren-Studien, 345 †; und Prof. R. Sieger, Untersuchungen in den Ötscherhöhlen, 221 †
Crater Lake, Oregon, by J. S. Diller, 341 †
Crawford, D., Photographs of country in neighbourhood of Lake Mweru, 352
Crete—
Correspondence respecting the Affairs of, 223 †
Crète autonome, La, par E. H. Moguez, 455 †
Report by Her Majesty's Commissioner in, 675 †
Crook, H. T., Orthography, etc., of Names for the National Maps, 691 †
Crookes, Sir W., Address by, 346 †
Crosse, W. H., Blackwater Fever, 236 †; The Treatment of Malaria and Blackwater Fever, 125 †
Cuba—
Independence of, by A. G. Pérez, 230 †
Industrial Cuba, by R. P. Porter, 230 †
Maps: Military Telegraph Lines (U.S. War Department), 239

Cugnin, E., L'Heure et la Longitude Universelles, 586 †
Cuillins, Skye, Glaciated Valleys in, by A. Harker, 224 †
Curaçoa and Dependencies, Trade of (Foreign Office Rep.), 462 †
Currents Papers, No. 3, by H. C. Russell, 465 †
Curtis, G., and J. Woodworth, Nantucket a Morainal Island, 340 †
Curve isometriche, Brevi considerazioni sull' impiego delle, per O. Marinelli, 343 †
Cusack-Smith, —, Trade of Valparaiso and District, 462 †
Cuttriss, S. W., on the Caves of Yorkshire, 658
Cyclone—
  Ueber den Genauigkeitsgrad der Bahnbestimmung, von E. Knipping, 233 †
Cyprus—
  Agriculture in, Report on, by P. Gennadius, 455 †
  Annual Reports, 455 †
  Development of, by Colonel Fyler, 111 †

D.

Daghestan mountains, 660
Dakota—
  Caverne de Cristal, La, par Miss Owen, 229 †
  Eastern South, Well-boring and Irrigation in, by N. H. Darton, 341 †
  South, Bad Lands of, by N. H. Darton, 684 †
Dalmatia—
  Dalmatien, von Dr. Havass, 110 †
d'Almeida, P., La Colonisation russe dans les gouvernements d'Oufa et d'Orenbourg, 112 †
Daly, Chief Justice C. P., obituary of, 572
Dama country, Benue region, 635
Damascus, Trade of (Foreign Office Rep.), 582 †
Damian, J., Seestudien, Lago di Serraia, etc., 221 †
Danckelman, Dr., on the Harmattan wind, 445
Dandushka barriers, Bokhara. 611–616
Danduschka, Die Barren der, von W. R. Rickmers, 582 †
Danish expedition to East Greenland, 449; Danish Ingolf-Expedition, The, 587 †
Dantz, Dr., geological explorations in German East Africa, 446
Danube—
  Lucrările Comisiuneĭ Europeane a Dunăreĭ, de D. A. Sturdza, 452 †
Darjiling—
  Besuch im Dardschiling, Ein, 579 †
Darton, N. H., Bad Lands of South Dakota, 684 †
Darwin, C., on Patagonia, 369, 372, 375
Darwin, Major, Review on "The International Geography," 656
Davis, A. P., Report of Progress of Stream Measurements, 341 †; Nicaragua and the Isthmian Routes, 462 †
Davis, Prof. W. M., Physical Geography, Review by H. R. Mill, 183; The Circulation of the Atmosphere, 586 †; The Geographical Cycle, 481 *; The Peneplain, 344 †
Dawkins, Major, Précis of Information concerning Southern Rhodesia, 338 †
Dawson, Dr. G. M., Geological Survey Map of Canada, 126
Dawson, Dr. S. E., The Voyages of the Cabots, 235 †
Dawson, W. Bell, Survey of Tides and Currents in Canadian Waters, 461 †
Day—
  Where does the Day begin? by F. H. Holmes, 461 †
Deasy, Captain H. P., letter from, on the Khotan river, 451; return of, 660
Debasien, Mount, East Africa, 135, 310
Debundja, Regenmessungen in, 460 †
Déchy, M. de, Photographs of the Caucasus, 469; explorations in the Caucasus, 660
Deep Ghyll, The West Wall of, by J. W. Robinson, 578 †
Deep sea—
  Deposits, 432; animals, 434
  Expedition: German, 10; ditto, by Drs. Chun, Schott, and Sachse, 587 †; Deutschen Tiefsee Expedition, von Dr. G. Schott, 345 †; Chemisch-geologische Tiefsee-Forschung, von Dr. Natterer, 345 †; Von der deutschen Tiefsee-Expedition, 118 †
  Exploring expedition of the *Albatross*, by H. M. Smith, 688 †
  Observations, methods of, 186, 187
  Temperatures, 35
Deeps, great, of the ocean, 428, 429
Delagoa Bay, the Key to South Africa. by M. G. Jessett, 682 †
Delagoa, Directory for 1899..337 †
Delebecque, A., et E. Ritter, Quelques lacs des Pyrénées, 112 †
Denmark—
  Kommissionen for videnskabelig Undersøgelse af de danske Farvande, 330 †
  Maps: Generalstabens topografiske Kaart over Danmark, 691
  Observations météorologiques-nautiques, 110 †
  Trade and Agriculture of (Foreign Office Rep.), 452 †
Dent, C. T., The First Ascent of Tsiteli, 226 †
Deputation to the Government for the National Antarctic Expedition, 190
Descamps, A., Village Arabes en France, 675 †
Des Vœux, Sir W., The Connection of England with Newfoundland, 683 †
Détrez, G., Recherches sur les Distances géographiques, etc., 687 †
Diatom ooze, 433

Diaz, Bartholomew, Pillar erected by, near Angra Pequena, Note on, by W. L. Sclater, 337 †
Dickenson, B., and A. Andrews, Educational Map Slides produced by, 673
Dickson, H. N., Prof. Pettersson on Methods of Oceanographic Research, 185 *
Dictionary of National Biography, by Sidney Lee, 124 †
Diener, Dr. C., Notes on the Geological Structure of the Chitichun Region, 579 †; Noch ein Wort über die Katastrophe von Sodom and Gomorrha, 226 †; Ueber die Bedeutung des geographischen Moments in geologischen Lokalmonographien, 688 †
Diller, J. S., Crater Lake, Oregon, 341 †
Dines, W. H., The Connection between the Winter Temperature and the Height of the Barometer, 233 †
Dingelstedt, V., The Hydrography of the Caucasus, 335 †
Dinklage, L., Treibeis in südlichen Breiten, 586 †
Djaghatu Chai, Lake Urmi region, 507, 519
Doering, O., Resultados Hipsométricos de Algunos Viajes, del Dr. Bodenbender, 584 †; Tomadas en la provincia de Córdoba, 584 †
Dolmens of Japan and their Builders, by W. Gowland, 580 †
Dominguez, Don F. L., remarks on "Explorations in Patagonia," 374
Donga river, Benue, 632
Donyu Elgon, British East Africa, 283; Donyu Ronyu, 283
Dooman, Rev. I., The Origin of the Japanese Race, 679 †
Drakensbergen, Notes on the Geology of the, by F. F. Churchill, 337 †
Drapeyron, L., Colonel Coello, J. V. Barbier, etc. (Biography), 124 †; Comment Michelet est devenu historien et geographe, 235 †
Drift-casks for the Determination of Arctic currents, 326
Drift-ice, observations on, 544
Droogmans, H., map of the Lower Congo, note on, 565, 694
Drummond-Hay, —, Trade of Beirut and Coast of Syria, 582 †
Drygalski, E. v., Die Grönland-Expedition der Gesellschaft für Erdkunde in Berlin, 231 †
Dubois, M., La Tunisie, 228 †
Dubreucq, R., Les populations naines de l'Afrique, 117 †
Dufresne, Dr. E., par E. Chaix, 124 †
Dumba town and people, 632
Dundas, —, Trade of Norway, 455 †
Dune Floras of Lake Michigan, Mr. Cowles on, 668, 683 †
Dunham, R. W., Maize and its Uses, 234 †
Dunstan, B., Report on the Mesozoic Coal Measures of Stanwell, 464 †
Duponchel, A., Nouvelle théorie cosmogonique, 125 †
Durban, W., The Trans-Siberian Railway, 680 †
Duruy, V., Mission dans le Nord-Ouest de Madagascar, 337 †
Dutch, Part borne by the, in the discovery of Australia, by J. E. Heeres, 685 †
Dutreuil de Rhins, J. L., Mission Scientifique dans la Haute Asie, 225 †
Dutreuil de Rhins, M., in Central Asia, letter from M. F. Grenard on, 328
Dybowski, J., Organization d'un voyage d'exploration, 347 †

E.

Eaglehawk and Crow, a Study of the Australian Aborigines, by J. Mathew, 685 †
Earth—
Age of the Earth as an Abode fitted for Life, by Lord Kelvin, 123,† 232,† 465 †
Plan of the, and its Causes, by J. W. Gregory, 465 †
Earthquake Waves—
Source of the Periodic Waves, etc., by H. C. Russell, 232 †
East Creek Amphitheatre, Exploration of the, by C. B. Bradley, 120 †
Easter Island—
Mission à l'île de Pâques, per Cap. Barclay, 342 †
Edmond, J. P., letter from, on "Was Australia discovered in the Sixteenth Century?" 574
Edvi, E. v., Die Lage der Isotherme, 233 †
Edwards, F. A., The Future of the Niger, 460 †
Edwards Plateau, Geology of the, etc., by Hill and Vaughan, 341 †
Edwards's Australasian Catalogue, by Mr. Petherick, 231 †
Egypt—
Despatches from Her Majesty's Agent, etc., by Sir W. Garstin, 336 †
Donati, Vitaliano, Il Viaggio in Oriente di, del P. Revelli, 459 †
Egypt after Omdurman, by J. Lowry Whittle, 336 †
Egypt, No. 3, Report . . . on Finances, etc., 117 †
Emerald Mines of Sikait, Expedition to the, by H. W. Seton Karr, 681 †
Ethnologische Stellung der . . . Aegypter, von R. Virchow, 336 †
Expansion of, under Anglo-Egyptian Condominium, by A. S. White, 681 †
Herodotus and Egyptian Geology, by Rev. F. Walker and Sir J. Dawson, 459 †
Irrigation Department, Report of the Administration of the, 227 †
Land of Goshen and the Exodus, by Major Brown, 117 †

Egypt—*continued.*
Public Works Department, Report upon the Administration of the, by Sir W. E. Garstin, 663, 681 †
Sudan, Sir W. Garstin's report on the, 208
Unter der Beduinen der ägyptischen Wüste, 118 †
Ehrenreich, Dr., Ein Ausflug nach Tusayan (Arizona), 683 †
Ekholm, N., und S. Arrhenius, Ueber . . . Periode der Polarlichter und Gewitter, 687 †
Elba, Island of, Trade of (Foreign Office Rep.), 454 †
Elberling, E., Ændringer i den politiske Geografi, 466 †
Eldoma Ravine, British East Africa, 276
Elgon, Mount, Central Africa, 133
Ella, Lake, Bear island, 58
Ellesmere Land, Dr. Stein's expedition to, 571
Elliot, D. G., Catalogue of Mammals from the Olympic Mountains, Washington, 684 †
Elliot. Prof. G. F. Scott, The Prospect in Chinese Trade, 456 †
Elliott, Sir C., The Recent Famine in India, 458 †
Ellis, W., Magnetic Results at Greenwich and Kew discussed and compared, 345 †
Elwes, H. J., On the Zoology and Botany of the Altai Mountains, 116; † on the Flora and Fauna of the Altai, 204
Enderby Land, Antarctic Regions, 478
Engadine, le Massif de la Bernina, par M. Maquet, 224 †
Engelhardt, A. P., A Russian Province of the North, 112 †
England—
Admiralty surveys on coasts of, 84
Eastern Counties, The, by C. S. Ward, Thorough Guide Series, 332 †
Flower and Fruit-farming in England, by W. E. Bear, 224 †
Popular Education in, Report on, by J. G. Hodgins, 332 †
England and Wales—
English and Irish Channels, Tidal Streams of the (charts), 351
Ordnance Survey Charts, 125, 237, 348, 467, 590, 691
Reduced Ordnance Survey of, by J. Bartholomew, 238, 347, 692
"Three Miles to Inch" Map of, by W. & A. K. Johnston, 468
Tidal Observations and Ordnance Spirit-Levelling, 578 †; note on, 571
Englishman, The Mean, by J. Jacobs, 332 †
Equatorial Province, Notes from the, by A. D. Milne, 582 †
Erratic Blocks of the British Isles, 332 †
Ethnography of Turkestan and Tibet, 91
Ethnological Text-book, by Mr. A. H. Keane, 449
Europe—
Anthropology and Ethnology of. Selected Bibliography of the, by W. Z. Ripley, 576 †
Bewölkung in Europa an Cyklonen- und Anticyklonen-Tagen, von Dr. C. Kassner, 330 †
Fort gången ap Europas allmänna topografiska Karfarbeten, af Ch. Tottie, 452 †
Geographical Picture of Mediæval Europe, by J. B. Nevine, 110 †
Géographie Militaire, etc., par O. Barré, 110 †
History of the European Fauna, by R. F. Scharff, 576 †
Kartenwerke der europäischen Staaten, von V. Haardt v. Hartenthurn, 330 †
Pflanzendecke Mitteleuropas nördlich der Alpen, von Dr. A. Schulz, 452 †
Sub-oceanic Terraces and River Valleys off the Coast of Western Europe, by Prof. Hull, 333 †
Westgrenze des letzten nordeuropäischen Inlandeises, von M. Hildebrandt, 452 †
Everglades, Across the, by H. L. Willoughby, 120 †; note on, 212
Explorations, Reports of, by A. R. Hasse, 690 †

F.

Færoe, Iceland, and Greenland—
Eléments Météorologiques des îles Féroé, de l'Islande, et du Greenland, 586 †
Færoes—
Færøernes Klima, af V. Willaume-Jantzen, 452 †
Glaciated Valleys in the, by J. Lomas, 452 †
Fairbairn, Prof. A. M., Race and Religion in India, 579 †
Fairchild, H. L., Glacial Lakes . . . in Central New York, 120 †
Falcon island, Pacific, 85
Falkland Islands, Annual Report (Col. Reports), 684 †
Fashoda and the Bahr-el-Ghazal, by J. H. Reed, 459 †
Fauvel, A., Tche-nam-po, nouveau port Coréen, 115 †; La Province du Tché-Kiang, 678 †
Fea, L., Dalle Isole del Capo Verde, 117 †
Federated Malay States, reports on, 662
Fenix river, Patagonia, 355
Fennell, C. W., Notes on some Physical Features in Iceland, 675 †
Ferrero, A., Rapport sur les Triangulations présenté . . . à Stuttgart, 686 †
Ferrière, A., Le port franc de Copenhague, 576 †
Fétichisme, Le, par S. Perregaux, 235 †
Fichtelgebirge in seiner Bedeutung für den mittel-europäischen Verkehr, von F. Nüchter, 453 †

Finland—
An English journal devoted to the cause of the Finnish People, by C. H. Perrott, 455 †
Atlas de Finlande, 692
Ätsärinselkä och Välivesi sjöar, af R. Hammarström, 331 †
Djupkarta öfver Lojo sjö, af A. E. Streng, 332 †
Downfall of, 331 †
Dynerna pa Tauvonsaari, af J. E. Rosberg, 332 †
Finland and the Tsar, by R. N. Bain, 112 †; ditto by Prof. E. Westermarck, 112 †
Finlands landryggar, af R. Hult, 331 †
Fysillis-maantieteellisiä tutkimuksia Kalvolan pitäjässä, by V. Borg, 331 †
Granbestånden i Finland, af A. E. Häyrén, 331 †
Nyländska dalar, af R. Hult, 331 †
Om Bötombergen, af R. Hammarström, 331 †
Pflanzenregionen des finnländischen Lappmarken, von R. Hult, 331 †
Russia in Finland, by Dr. J. N. Reuter, 112 †
Zigenarnes utbredning i Finland, af A. Thesleff, 332 †
Fipa Plateau and Rukwa Plain, Mgr. Lechaptois' journeys in the, 666
Fischer, Dr., Ueber seine Reisen im Marokkanischen Atlas, 228 †; journey in Marocco, 209
Fischer, Herr von, explorations in Patagonia, 568
Fisheries—
Congrès International de Pêches Maritimes, etc., par G. Lavieuville et J. Pérard, 587 †
Fiske, A. K., The West Indies, History, etc., 121 †
"Five Crosses" peaks, Bolivia, 19
Flag and Trade, The, by A. W. Flux, 689 †
Flamand, M., La traversée de l'Erg occidental, 226 †
Fletcher, A. C., A Study from the Omaha tribe, 340 †
Florida, Everglades of, Lieut. Willoughby's Journey across the. 120 †, 212
Flower, Sir W., obituary of, 217
Flux, A. W., The Flag and Trade, 689 †
Foa, M., After Big Game in Central Africa, 459 †; L'invasion européenne en Afrique, 226 †; Traversée de l'Afrique Equatoriale du Zambèze au Congo Français, 126
Föhns, Ueber verschiedene Entstehungsarten und Erscheinungsformen des, von R. Billwiller, 345 †
Fondouce, C. de, Contribution à une faune historique du Bas Languedoc, 222 †
Fontana, Lake, Patagonia, 356, 358
Foochow, Trade of (Foreign Office Rep.), 456 †
Foreman, J., The Philippine Islands, A Political . . . History, 115 †
Formosa—
Aborigines of, Ino Kakyo on, 443
Aborigines of Southern Formosa, by R. Torii, 679 †
Die wilden Stämme von, von Ino Kakyo, 334 †
Geography of Formosa on its Administration, by Y. Ishii, 679 †
Geological Exploration of, by Y. Ishii, 580 †, 679 †
Industries of, Present and Future of the, by J. Inouye, 580 †
Forth Valley, Geography of the, by D. B. Morris, 333 †
Fosse de Cap Breton, gully of the, 405
Foster, W., The Embassy of Sir T. Roe to the Court of the Great Mogul, 579 †
Foureau, M., expedition to French Congo, 319, 565; Patron's Medal awarded to, 102
Foureau-Lamy Mission, La marche de la, 228 †, 336, 680 †
Fouta-Djalon, Impressions du, 337 †; Les Ressources économiques du, par J. Machat, 459 †
Fowler, T. W., A Contribution to Australian Oceanography, 463 †; The Determination of Heights by Barometric Methods, 343 †
France—
Carte de, 1750–1898. Étude historique par Col. Berthaut, 222 †
Carte de, Rapport sur le projet de réfection de la, par M. de Lapparent, 343 †
Côtes de, Carte lithologique des, par J. Thoulet, 453 †
Embut de Caussols, par A. Janet, 330 †
Excursions de la Société de Géographie de Lille, par E. Cantineau, 452 †
Frankrijk en zijne landschappen, door J. Kuyper, 222 †
Map of, proposed, 441
Maps: Carte et Atlas Lithologique des Côtes de France, par M. Thoulet, 692
Massif Central, par A. Leroux, 330 †
North-west coast of, Changes in, 204
Observations centralisées par le service Hydrométrique du Bassin de la Seine, par M. Babinet, 452 †
Plus Beau Royaume sous le Ciel, par O. Reclus, 330 †
Ports maritimes français de l'Atlantique, par L. Imbert, 452 †
Projet de jonction géodésique entre la France et l'Italie, par C. de Thury, 222 †
Statistique Générale de la, 110 †
Trade of (Foreign Office Rep.), 452 †
Village Arabes en, par A. Descamps, 676 †
Francis, Rev. A., Notes of a Tour in Russia, 676 †
Franco-Anglaise, La Convention, 337 †
Franco-Brazilian contested Territory, M. Brousseau on, 213

Franconie, J., Le Régime des Chemins de fer dans l'Inde Anglaise, 115 †
Frankfort-on-Main, Trade of, by Sir Ch. Oppenheimer, 453 †
Franzius, L., and G. de Thierry, River Regulation Works . . . in Germany, 110 †
Franz Josef fjord, Greenland, 535
Franz Josef Land—
A Thousand Days in the Arctic, by F. G. Jackson, 122 †
Mammalia and Birds of, by W. S. Bruce and W. E. Clarke, 231 †
Mr. Wellman's expedition to, 326
Frech, Dr. F., Ueber die Gebirgsbildung im paläozoischen Zeitalter, 587 †
Free Church of Scotland, Report on Foreign Missions, 691 †
French—
Early maps of Java, 424
Expeditions in the Western Sudan, 320; on the Ivory Coast, 210
Niger railway, 564
Oceanographical work, 438
Freshfield, D. W., Hannibal's Pass, 221 †
Frick, J., The Vassalage of South America, 121 †
Friederichsen, Dr. M., On the Morphology of the Tian-Shan, 443
Fritsche, Dr., Die Elemente des Erdmagnetismus, etc., 345 †
From London to Karachi in a Week, by F. H. Skrine, 680 †
Früh, J., Der Postglaciale Löss im St. Galler Rheinthal, 578 †
Függer, M., Le "Nixloch" du Wildmoos près Fuschl, 221 †
Fulani race, Benue region, 631
Fülleborn, Dr., Expedition to Lake Nyasa, 94
Fuller, M. L., Sand-plain Formation, 688 †
Fulst, Dr. O., Ueber das sogenannte "Pagelsche Verfahren," 586 †
Funafuti, The Atoll of, its Zoology, etc., by C. Hedley, 342 †
Furber, T. F., Trigonometrical Survey of New South Wales, etc., 463 †
Furneaux Islands, Tasmanian Half-Castes of the, by E. Stephens, 686 †
Furness, Dr. W. H., Life in the Luchu Islands, 225 †
Futa Jallon, Exploration in, by Dr. Maclaud, 664
Futaleufu river, Patagonia, 324
Futterer und Holderer, Drs., Reise durch Central-Asien und China, 114 †
Fyler, Colonel, The Development of Cyprus, 111 †

G.

Gader Chai, Lake Urmi region, 507, 520
Gaedertz, Herr, journey in Shantung, 206
Galimard, J., Les Caveaux de Verpent, 222 †
Galland, De, Excursion à Bou-Saada, 680 †
Gallegos river, South America, 253, 257
Gallois, E., Excursion à la capitale de Tamerlan, 116 †
Game-preserve in British Central Africa, 211
Ganges, estuary of the, submarine gully, 410
Gannett, H., The Redwood Forest of the Pacific Slope, 229 †; on the Science of Map-making, 450
Ganong, W. F., Notes on the Natural History . . . of New Brunswick, 460 †; Upon Raised Peat-Bogs in New Brunswick, 119 †
Gaping Ghyll Cave, Yorkshire, 658
Garda, Lake, depth of, 441
Gardner Islands, Herr Schnee's Visit to the, 570
Garnier, C., Méthode de Transcription Rationnelle générale des noms géographiques, 236 †, 690 †
Garofalo, T. P., Estudios de Historia griega, 588 †
Garonne, Subterranean course of the, 407
Garriott, E. B., The West Indian Hurricane of August, 1899 . . 685 †
Garstin, Sir W., Egypt, Despatches . . . and Report on the Soudan, 336 †; Nile Flood, 227 †; report on the Egyptian Sudan, 208; report upon the Administration of the Public Works Department, 681 †
Garumna and Lettermullen, Ethnography of, by C. R. Browne, 333 †
Gautier, B., La pluie en Suisse et à Genève, 224 †
Gayem country, Benue region, 635
Gaza, 1897-1898, by Cap. G. da Costa, 682
Gebel Sês in der Harra und seine Ruinen, 336 †
Geer, G. de, Om Skandinaviens geografiska utveckling efter istiden, 577 †; Om den Senkvartära Landhojningen kring Bottniska Viken, 677 †
Gelcich, E., Die Schlussrechnung bei der Längenbestimmung aus Norddistanzen, etc., 344 †
General Paz, Lake, 360
Genetic classification of land-forms, 481
Gennadius, P., Report on Agriculture in Cyprus, 455 †
Geodesy—
Comptes-rendus des séances de la Douzième Conférence, par A. Hirsch, 687 †
Principien der Variationsrechnung, etc., von F. Rudio, 232 †
Triangulations présenté à la Douzième Conférence Générale à Stuttgart, par A. Ferrero, 686 †
Geodetic Survey of South Africa, 667
Geographic Board of Canada, 668
Geographical and Geological Exhibition at Springfield, by R. C. Dodge, 467 †
Geographical Association, Festival of the, at the University of Vienna, 659

Geographical Bibliography, International, 545
Geographical Congress, Seventh International, Proceedings of, 537–545; Resolutions of, 543; Plan of Excursions, 86, 453 †; Seventh International, 690 †; Internationale Geographenkongress zu Berlin, von H. Wagner, 690 †; Swiss, 347 †
Geographical Cycle, The, by W. M. Davis, 481 *
Geographical Discovery, Sixty Years' Progress of, by A. C. Macdonald, 467 †
Geographical Distances—
Recherches sur les Distances géographiques, etc., par G. Détrez, 687 †
Geographical documents in Switzerland, M. Marcel's discovery of, 216
Geographical Literature of the Month—
Africa, 117, 226, 336, 458, 582, 680
America, 119, 228, 338, 460, 583, 682
Anthropogeography and History, 124, 234, 346, 466, 588, 688
Asia, 113, 224, 333, 456, 579, 678
Australasia and Pacific Islands, 121, 231, 342, 463, 585, 685
Biography, 124, 235, 346, 588, 689
Europe, 109, 221, 329, 452, 576, 675
General, 124, 236, 347, 466, 589, 689
Mathematical Geography, 122, 232, 343, 464, 586, 686
Physical and Biological Geography, 123, 232, 344, 465, 586, 687
Polar Regions, 122, 231, 342, 464, 586, 686
Geographical Names—
Allgemeinen Transskription geographischer Namen, von Dr. Sieger, 690 †
Méthode de Transcription Rationnelle générale des noms géographiques, par C. Garnier, 236 †, 690 †
Notes on the spelling of some, by G. G. Chisholm, 467 †
Geographical Terminology, Time as an element in, 483
Geographisches Jahrbuch, von H. Wagner, 237 †
Geography—
Ændringer i den politiske Geografi, af E. Elberling, 466 †
Album Géographique, par MM. Dubois et Guy, 236 †
Alcuni studi di storia della Geografia antica, Nota del Prof. Ricchieri, 235 †
Allgemeine Erdkunde als Anhang zur Deutschen Schulgeographie, von Dr. Supan, 690 †
At the British Association, Dover, 546
Bibliographie géographique annuelle, 589 †
Economic Geography in Education, Position of, by Dr. A. J. Herbertson, 589 †
Geography—*continued.*
Enseignement rationnel de la géographie, 589 †
Function and Field of, by J. Scott Keltie, 347 †
Geografi italiani all' estero, del C. Bertacchi, 237 †
Geografia all' Esposizione di Torino, del Prof. B. Frescura, 589 †
Geographie als Universitätspach, von Dr. Löffler, 690 †
Géographie médicale, La, par H. Gros, 688 †
Geographische Unterricht an den deutschen Hochschulen im Sommersemester, 125 †
International Geography, by Seventy Authors, edited by H. R. Mill, 691 †; Review on, by Major Darwin, 656
Military, Methods of, Prof. Barré on, 671
Of Mammals, by W. L. and P. L. Sclater, 123 †
Oxford, School of, 2, 82; programme of, 559
Photocol-Sammel-Atlas, von Dr. Zimmerer, 236 †
Physical Geography in Secondary Schools, by Prof. Brigham, 467 †
Physical, of Central America, Dr. K. Sapper on, 95
Physical, Prof. Davis on, by H. R. Mill, 183
Progrès de la géographie pendant 1898, par le baron Hulot, 237 †
School of, at Oxford, 593
Teaching of Applied Geography, Report on, by Dr. A. J. Herbertson, 589 †
Theoretical geography, 483
Gerlache, M. de, expedition to the Antarctic, 7; L'expédition antarctique Belge, 686 †
German Colonies—
Deutsche Koloniallitteratur im 1897, von M. Brose, 467 †
Jahresbericht der Deutschen Kolonialgesellschaft, 467 †
Kolonial-Handels-Adressbuch, 690 †
German Deep-Sea Expedition, 10
German progress in the Cameroons, 565
German scientific researches on Lake Nyasa, 94
Germany—
Allgemeine Versammlung der Deutschen geologischen Gesellschaft, 111 †
Bestimmung der Intensität der Schwerkraft . . . bis Koburg und Göttingen, von L. Haasemann, 330 †
Brown Coal Mining in the Rhineland, 110 †
Cession of the Carolines to, 97
Commercial Development of, by C. Rozenraad, 110 †
Litauen, eine Landes- und Volkskunde, von Dr. A. Zweck, 222 †
Maps: Karte des Deutschen Reiches (Topogr. Bureau), 238, 348, 590

Germany—*continued.*
Meteorologischen Instituts, Veröffentlichungen des Königlich Preussischen, von W. von Bezold, 453 †
Obergermanisch-rätische Limes, von R. Gradmann, 111 †
Pêches maritimes en Allemagne, 453 †
River Regulation Works, etc., by Franzius and Thierry, 110 †
Seeburger See bei Göttingen, von Dr. Halbfass, 110 †
Steinhuder Meer, von Dr. Halbfass, 110 †
Thal- und Seebildung im Gebiet des Baltischen Höhenrückens, von Dr. Keilhack, 222 †
Ghewy, A. B., Real Municipal Government for London, 113 †
Giannitrapani, Colonel, La regione alpina, 111 †
Gibbons, Major, expedition to the Zambezi, 93
Giffen, Sir R., The Excess of Imports, 113 †
Giglioli, Prof., La Moneta tra popoli primitivi ed il "Birok" danaro aristocratico della Nuova Irlanda, 234 †
Gilbert, G. K., Recent Earth-movement in the Great Lakes Region, 339 †
Gilbert, Sir Humphrey, Termination of expedition of, by Rev. G. Patterson, 235 †
Giles (Gilles) Land, or White Island, 67, 170
Gill, —, Report of Her Majesty's Astronomer at the Cape of Good Hope, 681 †
Glaciers—
Bewegungsrichtungen des diluvialen Inlandeises, von Dr. J. Petersen, 123 †
Gletscher-Forschung, Neue Ergebnisse und Probleme der, von Dr. E. Richter, 232 †
Gletscher von Sulitelma und Ålmajalos, von J. Westman, 676 †
Of South-Eastern Alaska, Notes on, by O. J. Klotz, 523 †
Recent Glacier Investigations, Prof. E. Richter on, 316
Sea-ending, On the Advance and Retreat of, Letter from Sir M. Conway, 672
Tabular, of the antarctic, 556; Glacier ice, grain of, 557
Glasgow, Cyclist's Road Map of, by J. Bartholomew, 468
Globigerina ooze, 433
Gocher, Rev. H., Four Hundred Miles in Sarawak, 679 †
Gold in East Bokhara, 606, 607
Goodchild, J. G., Dr. Heddle and his Geographical Work, 346 †
Goodwin, H. B., The Simplification of Formulæ in Nautical Astronomy, 586 †
Gorst, H. E., China, 334 †
Gosha district, 637
Goshen, The Land of, and the Exodus, by Major Brown, 117 †
Goule-Noire (Isère), Projet d'utilisation de la grotte de, par E. Mellier, 330 †
Gowland, W., The Dolmens of Japan and their Builders, 580 †
Grace, M. S., A Sketch of the New Zealand War, 686 †
Gradmann, Dr., Der obergermanisch-rätische Limes, 111 †; note on, 89
Graffigny, H. de, Explorations of the Upper Atmosphere, 345 †
Graham Land, Antarctic Regions, 476
Gran Chaco, Boat Journey across the, 567; Massacre of Signor Ibarreta's expedition to, 214
Grand River, Michigan, Mouth of, by E. H. Mudge, 584 †
Grandjean, A., L'Invasion des Zoulou dans le Sud-Est Africain, 228 †
Grant of Rothiemurchus, by W. S. Seton-Karr, 689 †
Gravity—
Bestimmung der Gravitationsconstante, etc., von Richarz und Krigar-Menzel, 232 †
Relative Schwerebestimmungen durch Pendelbeobachtungen, 343 †
Gray, R. K., on submarine river escapes, 401
Great Fish Bay—
Von der deutschen Tiefsee-Expedition, 118 †
Greeks—
Estudios de Historia griega, por T. P. Garofalo, 588 †
Greenland—
East: Danish expedition to, 449; Swedish Expedition to, 97
Expeditions in, 97, 325, 448
Förslag till en expedition till östra Grönland, von Prof. Nathorst, 343 †
Grönland-Expedition der Gesellschaft für Erdkunde, von E. v. Drygalski, 231 †; ditto, von E. Richter, 232 †
Swedish East Greenland Expedition, by Dr. Nathorst, 534
Gregor, J., Trigonometrische Hohenbestimmung . . . von Laibach, 221 †
Gregory, Dr. J. W., remarks on "Explorations in Patagonia," 375; The Plan of the Earth and its Causes, 465 †
Grenard, F., Carte de l'Asie Centrale, 238; letter from, on M. Dutreuil de Rhins in Central Asia, 328; on the Ethnography of Turkestan and Tibet, 91; Surveys in Central Asia, 442; Voyage de M. et Mme. Rijnhart dans le Tibet oriental, 114 †
Grenfell, W. T., Climate and Travel in Labrador, 683 †
Grevé, C., Die geographische Verbreitung der jetzt lebenden Perissodactyla, etc., 346 †
Gribaudi, P., L'avvenire economico della Cina, 456 †

Gribble, Fr., The Early Mountaineers, 347 †
Gribingi river, 320
Griesbach, Dr. L., General Report . . . of the Geological Survey of India, 458 †
Groffier, V., Travaux géographiques des missionaires catholiques, 467 †
Gros, H., La géographie médicale, 688 †
Grosvenor, G., Plans for reaching the South Pole, 586 †
Grulich, O., Katalog der Bibliothek, 236 †
Gruner, Dr., on the Harmattan wind, 445
Guadeloupe en 1899, par A. Isaac, 685 †
Guaicurú, del G. Boggiani, 230 †
Guallabamba river, Patagonia, 377
Guash Ngishu tribe, 147
Guaso Masa river, British East Africa, 277
Guayakis of Paraguay, Dr. R. Lehmann Nitche on the, 567
Guayaquil, Trade of (Foreign Office Rep.), 462 †
Guiana—
Dutch: De Boven-Nickerie onderzocht en in Kaart gebracht door C. van Drimmelen, 230 †; Het Fransch-Braziliaansch grensgeschil . . . van Nederlandsch Guiana, door Dr. Benjamins, 230 †
French: La Guyane Française, etc., par G. Brousseau, 230 †
Historique sommaire du conflit anglo-Vénézuélien en Guyane, par G. Pariset, 230 †
Guinea, Upper, The Harmattan in, 445
Gule, Central Africa, 138
Gulf Stream in the Arctic Regions, 176
Gulliver, F. P., Shoreline Topography, 344 †
Günther, Dr. S., Das bayerisch-böhmische Erdbeben, 110 †
Gunther, R. T., Contributions to the Geography of Lake Urmi and its Neighbourhood, 504 *
Guy, C., Le Transvaal, 228 †

H.

Haardt v. Hartenthurn, V., Die militärisch-wichtigsten Kartenwerke der europäischen Staaten, 330 †
Haddon, Dr. A. C., studies in Torres Straits, 302
Hague, A., Early Tertiary Volcanoes of the Absaroka Range, 339 †
Hahl, Dr., Der Bismarck-Archipel und die Salomons-Inseln, 463 †
Haidahs of the Queen Charlotte Islands, Origin of the, by J. Campbell, 119 †
Haïnan, l'île de l'Exil, par C. Jeremiassen, 114 †
Haïti—
Geologische Studien in, von L. G. Tippenhauer, 230 †
Halbfass, Dr. W., Der Arendsee in der Altmark, 577 †; Das Steinhuder Meer, 110 †; Der Seeburger See bei Göttingen, 110 †
Hall, Prof. C., Distribution of the Keewatin in Minnesota, 684 †
Halle, Beschreibung der Stadt, von G. Lorenz, 577 †
Hamberg, H. E., La pression atmosphérique en Suède, 677 †
Hamburg, Trade of (Foreign Office Rep.), 453 †
Hammarström, R., Om Bötombergen, 331 †; Ätsärinselkä och Välivesi sjöar, 331 †
Hammer, E., Vergleichung einiger Abbildungen eines kleinen Stücks der ellipsoidischen Erdoberfläche, 344 †
Hampshire, Handbook of, by John Murray, 113 †
Hamy, Dr., on early maps of Java, 423
Hankow, Trade of (Foreign Office Rep.), 679 †
Hannibal's Pass, by D. W. Freshfield, 221 †
Hanno, Der Periplus des, von Dr. K. E. Illing, 466 †
Hanse Towns, Development of the, by E. C. Semple, 454 †
Haparanda, etc., Bestimmung der Intensität der Schwerkraft auf den Stationen, von P. G. Rosén, 578 †
Harker, A., Glaciated Valleys in the Cuillins, Skye, 224 †
Harmattan in Upper Guinea, Drs. Gruner, Mischlich, and von Danckelman on, 445
Harra, Gebel Sēs in der, und seine Ruinen, 336 †
Harrisse, H., The Cabots, Notes on certain Papers contributed to the Transactions of this Society, 466 †
Hartgebirge, Glaciale Erscheinungen vom, von Dr. Mehlis, 223 †
Harvie-Brown, J. A., On a Correct Colour Code, etc., 125 †
Hasse, A. R., Reports of Explorations, 690 †
Hassert, Dr. K., Die geographische Lage und Entwickelung Leipzigs, 453 †
Hauer, Franz von, Zur Erinnerung an, von Dr. A. Böhm, 235 †
Haupt, H., The Problem of the Mississippi, 120 †
Hausa tribe, 636
Hauser, H., Études sur les Colonies Allemandes, Togo, 460 †
Hauttecœur, H., L'île d'Amorgos, 453 †
Havass, Dr., Dalmatien, 110 †
Havelock, W., The Trans-Baikal, 582 †
Hawaii—
Hawaiian Islands, The, by W. Maxwell, 342 †
Hayden, Ensign E., Clock-Rates and Barometric Pressure . . . at Mare Island Observatory, 464 †
Hayden, H. H., On the Geology of Tirah and the Bazar Valley, 579 †
Hayek, Dr. G. v., Die afrikanische Transcontinentalbahn, 226 †

Hayes, C. W., Physiography of the Nicaragua Canal Route, 463 †
Häyrén, A. E., Grandbeständen i Finland, 331 †
Hazen, A., The Clarification of River Waters, 123 †
Hazrat Tahan, Bokhara, 608, 609 *note*, 613
Health Exhibition for Travellers, 672
Heawood, E., Was Australia discovered in the Sixteenth Century? 421 *
Hebrew and Greek Inscription relating to the Boundary of Gezer, by Prof. Clermont-Ganneau, 226 †
Hector, Sir J., Presidential Address to Australasian Association for the Advancement of Science, 466 †
Heddle, Dr., and his Geographical Work, by J. G. Goodchild, 346 †
Hedin, Dr. Sven, work in Central Asia, 90; Durch Asiens Wüsten, 225 †
Hedley, C., The Atoll of Funafuti, its Zoology, etc., 342 †
Heeres, J. E., The Part borne by the Dutch in the Discovery of Australia, 585 †, 685 †
Heiderich, Dr., Schattenplastik und Farbenplastik, 122 †
Heiderich, F., Die Weizenproduction der Erde, 688 †
Heilprin, A., Alaska and the Klondike, 583 †
Hemsley, W. B., note on the botany of Sir Martin Conway's expedition, 32
Henry, A. J., Wave or Billow Clouds, 465 †
Hepworth, W. C., The Value of Meteorological Observations at Sea, 233 †
Héraud, G., Léopold Manen, ingenieur hydrographe, 346 †
Herbertson, A. J., Monthly Rainfall over the Land Surface of the Globe, 688 †
Herbertson, A. J. and F. D., Man and his Work, 588 †
Herbertson, Dr. A. J., Commercial Geography of the British Isles, 677 †; Position of Economic Geography in Education, 589 †; Report on the teaching of Applied Geography, 589 †
Hereford Earthquake of 1896, etc., by E. Greenly, 578 †
Hérèns, C., La Caverne de Ratelstein en Styrie, 221 †
Hergesell, H., Ergebnisse der internationalen Ballonfahrten, 124 †
Hermann, J., Ort und Ursache der Strandungen deutscher Seeschiffe, 347 †
Hermite, G., Sur un voyage aérien de longue durée, 689 †
Herodotus, How far his remarks bearing on Egyptian Geology are reliable in the Light of Recent Egyptian Research, by Rev. F. Walker and Sir J. Dawson, 459 †
Herrmann, Captain, surveys in Bukoba, 321
Hessel, F. J., Sur le commerce du "caucho" dans l'Amérique du sud. 685 †
Hesse-Wartegg, E. von, Schantung und Deutsch-China, 679 †
Hewitt, J. F., The Pre-Aryan Commercial Village in India and Europe, 225 †
Higgins, E. E., Some of the Larger Transportation Problems in Cities, 237 †
Highway of the Nations, The, by Colonel Mark Bell, 678 †
Hill, Hon. D., Original Territory of the United States, 120 †
Hill, W. B., Antient Southampton, Catalogue of Works of Art belonging to, 677 †
Hill-Tout, Prof., Notes on the . . . Squamish Indians of British Columbia, 119 †
Hirsch, A., Comptes-rendus des Séances de la Douzième Conférence de l'Association Géodésique, 686 †
Historical Atlas of Modern Europe, by R. L. Poole, 126, 468
Hobbs, W. H., The Diamond Field of the Great Lakes, 461 †
Holdich, Colonel Sir T. H., remarks on "Journeys to the North of Uganda," 153; remarks on "Travels in Bokhara," 618
Holland—
  Au pays de Rembrandt et de Frans Hals, par V. de Swarte, 454 †
  Franken in Drenthe, door Dr. J. te Winkel, 675 †
  Het Brongas in Nederland, door J. Lorié, 223 †
  Komen er "Franken" voor in Drente of "Kelten," door Dr. J. Sasse, 675 †
  Noordnederlandsche tongvallen, door Dr. te Winkel, 223 †
  Reading List on the Netherlands, by E. G. Thorne, 331 †
Hollway, H. S., Bibliography of Books, etc., relating to South Africa, 338 †
Holmes, F. H., Where does the Day begin? 464 †
Holmquist, P. J., Om Rödöområdets, 677 †
Homolka, J. (Biography of), Emerich v. Péchy, 235 †
Hooker, Sir Joseph, remarks on the National Antarctic Expedition, 195
Hope Island, Spitsbergen, 59, 60
Hopkins, —, Trade of Chefoo, 456 †
Horák, B., Botanische Reise nach Montenegro, 112 †
Horizon—
  Variations de l'horizon apparent, de M. Forel, 687 †
Hosie, —, Trade of Wuchow, 457
Hostains and d'Ollone, MM., explorations of the upper Kavalli, 320
Hotz, A., on Persian Trade Routes, 91
Howard, —, Trade of Pernambuco and District, 462 †
Howarth, O. W., on Western Oaxaca, 669
Howell, F. W, Iceland, the Wonderland of Europe, 111 †; journey across the Láng Jökull, 441
Howell, H. H. (Biography), 588 †

Hübl, A. von, Beiträge zur Technik der Kartenerzeugung, 232 †; Das photogrammetrische Höhenmessen, 344 †
Hudleston, W. H., On the Eastern Margin of the North Atlantic Basin, 327
Hudson Bay, Rising of the Land around, by R. Bell, 229 †
Hull, Prof. E., On the Sub-Oceanic Physical Features off the Coast of Western Europe, 333 †, 465 †; Physical Conditions of the Mediterranean Basin, 455 †; Where is Mount Sinai? 458 †
Hulot, Baron, Rapport sur les progrès de la géographie pendant 1898..237 †
Hult, R., Finlands landryggar, 331 †; Die Pflanzenregionen des finnländischen Lappmarken, 331 †; Nyländska dalar, 331 †
Humboldt's Reise nach Amerika, 689 †
Hunan, Recent Journey from Shanghai to Bhamo through, by Captain Wingate, 639 *
Hungary—
 Bevölkerungsverhältnisse der ungarischen Städte, von Dr. Thirring, 223 †
 Cavernes de Hongroie, Notes sur les, par Ch. Siegmeth, 223 †
 Klamm im Grossen Sokol, von M. Karolluy, 675 †
 Photographs of, by Geographical Institute of the Royal Hungarian University, 470
Huni, A., Les Flottes de commerce et le trafic maritime, 234 †
Hun Kiang Gorges, Through the, by R. T. Turley, 292 *
Hunter, W., London's Water Supply, 113 †
Hurley, Mrs., The Gold-diggings at Bathurst, 342 †
Hutchinson, L., A Neglected Region of the Sierra, 120 †
Hydrometer, An Improved Form of, by Rev. H. O'Toole, 233 †
Hygrometry—
 De la manière d'utiliser les observations hygrométriques, par A. Lancaster, 465 †
Hypsometer als Luftdruckmesser, von H. Mohn, 464 †

I.

Ibarreta, Signor, massacre of expedition under, in the Gran Chaco, 214
Ibn Batuta's Travels, Translation of, into Urdu, 672
Ibrahim, Lake, Central Africa, 132
Ice—
 Admiral Makaroff on ice-breaking steamer, 546
 Effect of Ice-melting on Oceanic Circulation, 587 †
 Grain of ice of glaciers, 557
 Observations on drift-ice, 544
Iceland—
 Explorations in, by Dr. Thoroddsen, 331 †
Iceland—*continued.*
 Højlandet ved Langjökull paa Island Rejseberetning, af Dr. Thoroddsen, 454 †
 Howell, Mr. F. W., journeys in, 441
 Notes on some Physical Features in, by C. W. Fennell, 675 †
 Saga-steads of, A Pilgrimage to the, by W. Collingwood and Stefansson, 675 †
 The Wonderland of Europe, by F. W. Howell, 111 †
 Trade of (Foreign Office Rep.), 454 †
Ichang, Trade of (Foreign Office Rep.), 457 †
Idaho Basin, Mining Districts of the, by W. Lindgren, 340 †
Illecillewaetgletscher im Selkirkgebirge, von A. Penck, 119 †
Illimani, ruined village on, 23
Illing, Dr. K. E., Der Periplus des Hanno, 466 †
Illinois, State of, Coal-mining in the (Foreign Office Mis.), 683 †
Imbert, L., Quelques ports maritimes français de l'Atlantique, 452 †
I-men and Ching-tung, country between, 641
Immanuel, Hauptmann, Die Gebirge Nordsibiriens, 335 †
Imports, The Excess of, by Sir R. Giffen, 113 †
Impressions of America, by T. C. Porter, 461 †
Inambari river, South America, 214
India(n)—
 Admiralty Surveys on coasts of, 86
 Agrarian Conditions under British and Native Rule, by M. F. O'Dwyer, 334 †
 Archæological Tour with the Buner Field Force, Report of an, by A. Stein, 458 †
 Chemins de fer dans l'Inde Anglaise, par J. Franconie, 115 †
 Embassy of Sir T. Roe to the Court of the Great Mogul, edited by W. Foster, 579 †
 Famine in India, The Recent, by Sir C. Elliott, 458 †
 From London to Karachi in a Week, by F. H. Skrine, 680 †
 Geological Survey, General Report, by C. L. Griesbach, 458 †
 Maps: Government surveys, 693
 Memoria historico-economica . . . da India portugueza, por F. X. E. Fernandes, 335 †
 Nederlandsche factorijen in Hindostan, door P. H. Van der Kemp, 225 †
 North-West Provinces and Oudh, Report on the Administration of the, 225 †
 Ocean, Temperatures of the, 38, 40, 44
 Pre-Aryan Commercial Village in Europe and, by J. E. Hewitt, 225 †
 Race and Religion in, by A. M. Fairbairn, 579 †

India(n)—*continued.*
Survey of India Department, General Report on the Operations of the, by Major-General Strahan, 335 †
Surveys, Report on the, for 1897-98.. 313
Indiana and Ohio, Water Resources of, by F. Leverett, 340 †
Ingolf Expedition, The Danish, 587 †
Innthal bei Kufstein und die Eiszeit, von J. Jaeger, 221 †
Insulinde, Voyage de MM. Hiller, Hamson et Furness, 115 †
International Geographical Congress: *see* Geographical Congress
International Geography, edited by H. R. Mill, 691 †
Ionian Islands, Trade of (Foreign Office Rep.), 453 †
Ireland—
Round Towers of, A List of the, by T. J. Westropp, 333 †
Iron Gate defile, Bokhara, 599
Irrigation, Scientific Study of, by Dr. True, 589 †
Isaac, A., La Guadeloupe en 1899.. 685 †
Isak Island, Lake Urmi, 515
Iseo, Lake, depth of, 441
Ispahan and District, Trade of (Foreign Office Rep.), 581 †
Ispir Island, Lake Urmi, 515
Italian Expedition to the Amazon Valley, 213
Italian Geographers—
Geografi italiani all' estero, del C. Bertarchi, 237 †
Italy—
Alessandro Volta ed i suoi studi sulle fontane ardenti di Pietramala edi Velleja, del M. Baratta, 454 †
Émigration italienne et la Colonisation, par A. Ebray, 454 †
Emilia e Romagna, del E. Rosetti, 111 †
Ghiacciai in Italia nel 1898, Lo studio del movimento dei, di G. Marinelli, 223 †; Ghiacciai italiani del Bernina, del L. Marson, 223 †
Gli studi limnologici italiani, del C. Battisti, 111 †
Laghi italiani, Sullo stato attuale degli studi batometrici dei, del G. De Agostini, 454 †; note on, 441
Maps: Carta d'Italia (Istituto Geo. Militare), 348
Meteorologiche mensili . . . in Italia, di G. Saija, 223 †
Misure magnetiche eseguite in Italia, di L. Palazzo, 454 †
Pêcheries de la Vénétie, par J. Nourse, 675 †
Ivory Coast—
Côte d'Ivoire, par F. J. Clozel, 459 †
French explorations on the, 210
I-Wu and I-Bang, Shan States, 380

J.

Ja river, Congo basin, 445
Jack, R. L., Geological Map of Queensland, 469
Jackson, F. G., A Thousand Days in the Arctic, 122 †
Jacobs, J., The Mean Englishman, 332 †
Jäderin'sche Basis, Der, von S. Truck, 232 †
Jaeger, J., Das Innthal bei Kufstein und die Eiszeit, 221 †
Jajec, die alte Königsstadt Bosniens, von Dr. M. Bräss, 329 †
Jamaica, Public Finance and Resources of, 341 †
James, B. B., The Labadist Colony in Maryland, 584 †
Jan Mayen island, 535
Japan—
Climatological Division of, by G. Kakagawa, 679 †
Commercial Development of, by O. P. Austin, 580 †
Dolmens of Japan and their Builders, by W. Gowland, 580 †
Foreign Trade of (Foreign Office Rep.), 580 †
Geologic Structure of, by T. Ogawa, 580 †
Government survey map of Korea, 468
Harbours of, by T. Nasa, 115 †
Japan historique et artistique, par M. Ribaud, 115 †
Maps: Map of Japan for Tourists (Welcome Society of Japan), 238
Origin of the Japanese Race, by Rev. T. Dooman, 679 †
Otsuji Coal-Fields in Onga, by T. Suzuki, 580 †
Reading List on, by H. K. Gay, 335 †
Sprichwörter und bildlichen Ausdrücke der Japanischen Sprache, von P. Ehmann, 335 †
Japan and Korea—
Promenades japonaises et coréennes, par D. Lièvre, 225 †
Jardine, Sir J., British North Borneo, 115 †
Jared Sparks and Alexis de Tocqueville, by H. B. Adams, 340 †
Java—
Anniversary Address, Java, by Hon. W. Allan, 115 †; in early cartography, 422, 424
Meteorologische Beobachtungen zu Tosari, von J. Kohlbrugge, 225 †
Over Boro-Boedoer, door J. W. Ijzerman, 679 †
Trade of (Foreign Office Rep.), 580 †
Jeans, Rev. G., Handbook for travellers in the Isle of Wight, 113 †
Jebjeb town, Niger Protectorate, 180
Jefferson, Mark, Beach Cusps, 232 †
Jengger-gebied, Nota betreffende het, door H. M. la Chapelle, 580 †

Jenner, A. C., expedition from Kismayu to Logh, 637
Jennings, A. V., On the Courses of the Landwasser and the Landquart, 578 †
Jenolan Caves and the Blue Mountains, 686 †
Jerrmann, L., Reise durch das Flussgebiet des Rio Ipané, 230 †
Jersey, Climate of, by Rev. H. W. Yorke, 674 †
Jerusalem and Jaffa, Trade of (Foreign Office Rep.), 116 †
Jessett, M. G., The Key to South Africa: Delagoa Bay, 682 †
Jesup North Pacific Expedition, 96; Field Work of the, 347 †
Jewish Colonization Association, 688 †
Jewitt Daghi, Lake Urmi, 515
Jews—
Anthropologie der Juden, Ripley über die, 588 †
Jibuti—
Voyage à Djibouti, par M. Charmetant, 227 †
Jogan, R., Madagascar en 1898..118 †
Johansen, Lieut., Nansen und ich auf 86° 14'..231 †
Johns Hopkins Glacier, Alaska, 527
Johnsen, Captain, map of King Charles Land, 70, 71
Johnston, W. & A. K., Map of the Transvaal, 469; "Three Miles to Inch" Map of England, 468
Johnston, W. S., Photographs of Sierra Leone and the Gold Coast, 240
Joly, J., On the Geological Investigation of Submarine Rocks, 233 †
Jones, Prof. R., Notes on the Geology of West Swaziland, 118 †
Jordan, D. S., and B. W. Evermann, The Fishes of North and Middle America, 119 †
Jordan, J. N., Report on trade and commerce of Korea, 561
Juba, Mr. Jenner's expedition from Kismayu to Logh on the, 637
Juggarow Observatory, Report . . . of the, 579 †
Jullien, R. P., Chez les Papous, 685 †
Junin de los Andes, 366
Jura, Quelques explorations spéléologiques dans le, par E. Fournier, 330 †

K.

Kaalaas, B., Beiträge zur Lebermoosflora Norwegens, 112 †
Kagera river, East Africa, 321
Kahyo, Ino, on the Aborigines of Formosa, 443
Kaiser Nicholas II. range, 664
Kalahari desert, 310
Kamchatka—
Glimpses of Life in the Far North-East, by G. E. H. Barrett-Hamilton, 335 †
Kamchatka, by G. Barrett-Hamilton, 226 †
Kamerun—
Astronomische Ortsbestimmungen in Kamerun, von Hauptmann v. Besser, 460 †
Besitzergreifung des Hinterlandes von, von Dr. S. Passarge, 337 †
Excursion au, par F. Chapuis, 227 †
Geographischen Verhältnisse des Bezirkes Lolodorf, von Freiherrn v. Stein, 681 †; note on, 664
Geologen Dr. Esch über eine Reise in das Nkossiland, 682 †
German progress in the, 565
Karte des nördlichen Bulugebietes, Begleitworte zu der, von M. Moisel, 227 †
Regenmessungen in Debundja, 460 †
Kamptz, Hauptmann von, expedition to South Adamawa, 565
Karakoram—
Biafo Glacier and Hispar Pass in the, Ascent of, by F. B. Workman, 579 †
Karamojo tribe, Central Africa, 136; Plains of, 309
Karatagh, Bokhara, 600
Karoliny, M., Die Klamm im Grossen Sokol, 675 †
Karr, H. W. Seton, Expedition to the Emerald Mines of Sikait, 681 †
Karshi, Bokhara, 598
Kasai basin, Lakes of the, Mr. Verner on, 211
Kasamba marsh, Bangweulu region, 562
Kassner, Dr. C., Ueber die Bewölkung in Europa an Cyklonen- und Anticyklonen-Tagen, 330 †
Katsena river, Benue, 632, 634
Kavalli river, 210; MM. Hostains and d'Ollone's explorations of, 320
Kavirondo, British East Africa, 278
Keane, A. H., Man, Past and Present, 124 †; note on, 449
Kearton, R., With Nature and a Camera, 224 †
Keene, Major, The Third Burmese War, 115 †
Keewatin in Minnesota, Distribution of the, by Prof. Hall, 684 †
Keilhack, Dr., Thal und Seebildung im Gebiet des Baltischen Höhenrückens, 222 †
Keltie, Dr. J. Scott, The Function and Field of Geography, 347 †
Kelvin, Lord, The Age of the Earth as an Abode fitted for Life, 123 †, 232 †, 465 †, Ditto, by Prof. Chamberlin, 465 †; remarks on the National Antarctic Expedition, 196
Kent, Agriculture of, by Ch. Whitehead, 677 †
Kenya, position and height, 283 *and note*; Mr. Mackinder's expedition to, 93, 564
Kerry, Ruins of Ancient Settlement in, Mr. S. Macalister's survey of, 658
Kershaw, L. J., Report on the Trade between Assam and the adjoining Foreign Countries, 458 †

Khartoum-Omdurman et la chute du Mahdisme, par Dr. Abbate Pasha, 459 †
Khedivial Geographical Society—
Musée de Géographie et d'Ethnographie, par Bonola Bey, 236 †
Khedivic Possessions in the Basin of the Upper Ubangi, by S. Capenny, 336 †
Khokand and China, by E. H. Parker, 581 †
Khotan river, letter from Mr. H. P. Deasy on, 451
Kibwezi, road-making at, 271
Kiepert, H., Selbstbiographie von, 235 †
Kikuyu, British East Africa, 273
Kilimanjaro—
Astronomische Ortsbestimmungen . . . im Kilimandjaro-Gebiet, von Dr. Maurer, 460 †
Barometrische Höhenmessungen am Kilimandjaro, von Dr. H. Meyer, 681 †
Gletscher des, von Dr. Meyer, 118 †
Kilimandscharo-Bevölkerung, von Dr. Widenmann, 681 †
Kinabulu, Mount, Mr. Burls' ascent of, 207
King Charles Land, 52–69, 172; Geography of, 161 *et seq.*; plants of, 166; conditions of ice at, 169; Verzeichnis der Phanerogamen in König Karls Land, von Andersson und Hesselman, 343 †
King, Hon. P. G., Antarctic and Southern Exploration, 343 †
King Oscar's fjord, Greenland, 535
Kirchhoff, Dr. A., Umrisse zu einer Landeskunde der Karolinen, 585 †
Kirjawa, fossils at, 518
Kismayu to Logh, Mr. Jenner's expedition from, 637
Kinkiang, Trade of (Foreign Office Rep.), 457 †
Kivu, Lake, and Albert Nyanza, Mr. A. Sharpe's explorations at, 662
Kizil Kugur, Lake Urmi, 515
Klein, Dr. Jahrbuch der Astronomie und Geophysik, 234 †
Klondike—
Au Klondyke, par E. de Lamare, 120 †
Au Klondike vers le pays de l'Or, par J. Servigny, 683 †
Aux Mines d'Or du Klondyke, par L. Boillet, 339 †
Expedition till Klondike, af O. Nordenskjöld, 120
Klondike, by Miss Flora Shaw, 120 †
Klondyke, l'Alaska, le Yukon, etc., par M. L. de Lobel, 229 †
Pioneering in, by A. Macdonald, 229 †
Klotz, O. J., Notes on Glaciers of South Eastern Alaska, 523 *
Knipping, E., Ueber den Genauigkeitsgrad der Bahnbestimmung barometricher minima, 233 †
Knox, A., A Guide to Recent Large-scale maps, 237 †; Geographical Index to Books, etc., 467 †
Kochait mountain, Patagonia, 263
Kolb, Dr. Georg, Death of, 672
Kondeland, Weitere Resultate der meteorologischen Beobachtungen im, 459 †
Köppen, Dr., Ist die Veröffentlichung von (meteorologischen) Einzelbeobachtungen vom Ozean anzustreben? 344 †
Korea—
Maps: Japanese map of Korea and parts of China, 468
Tche-nam-po, nouveau port Coréen, par A. Fauvel, 115 †
Trade of (Foreign Office Rep.), 580 †; Trade and Commerce of, Report by Mr. Jordan, 561
Korean settlers in Manchuria, 296
Korshinsky, S., Tentamen Floræ Rossiæ orientalis, 112 †
Koyun Daghi island, Lake Urmi, 513, 514
Krafft, Dr. A. von, Mittheilungen über das ost-bokharische Goldgebiet, 116 †
Krämer, Dr. A., Die samoanische Königsfrage im Hinblick, 122 †
Kretschmer, K., Nordenskiöld's Periplus, 235 †
Krüger, Dr. Paul, Explorations in Patagonia, 324
Kruijt, A. C., De adoptie in verband met het matriarchaat bij de Toradja's van Midden-Celebes, 580 †
Kükenthal, Prof., map of King Charles Land, 73
Kutch-Manor, Bokhara, 605
Kuyper, J., Frankrijk en zijne landschappen, 222 †
Kwebe hills, South Africa, 312
Kwei-chau, 641
Kythera, Die Insel, von Dr. Leonhard, 223 †

L.

Labrador—
Climate and Travel in, by W. T. Grenfell, 683 †
Rapport sur un projet d'expédition au, par E. Richet, 119 †
Lachine Rapids, Temperature of the, by H. T. Barnes, 229 †, 345 †
Lahache, M., L'eau dans le Sahara, 226 †
Lahovari, G. J., Marele Dicționar Geografic al Romîniei, 676 †
Laibach, Trigonometrische Hohenbestimmung . . . , von J. Gregor, 221 †
Lakes—
Seestudien, Lago ni Serraia, etc., von J. Damian, 221 †
Temperature of, and their classification, by A. Tanaka, 586 †
Lamare, E. de, Au Klondike, 120 †
Lamb, —, Trade of Suakin, 459 †
Lancaster, A., Court Aperçu du climat du Congo, 459 †; De la manière d'utiliser les Observations hygrométriques, 465 †
De l'intérêt des relevés journaliers des heures de Soleil, 452 †

Landberg, Comte de, Arabica, 333 †; Die Expedition nach Süd-Arabien, 224 †; Die Südarabische Expedition, 678 †
Land-forms, The genetic classification of, 481; Land-waste, Forms assumed by, 502
Land-hemisphere, The Pole of the, Prof. Penck on, 98
Landoberfläche, Die Pole der, von A. Penck, 233 †
Landwasser and the Landquart, On the Courses of the, by A. V. Jennings, 578 †
Langhans, P., Deutsche und Dänen in Nordschleswig, 223 †
Láng Jökull, Mr. Howell's journey across, 441
Languedoc, Bas, Faune historique du, par C. de Fondouce, 222 †
Lanin volcano, Patagonia, 366, 367
Lankester, Prof. Ray, remarks on the National Antarctic Expedition, 197
Laos—
Haut Laos, sa situation économique, par Dr. Lefèvre, 580 †
La Paz river, Bolivia, 16
La Pérouse's expedition, Relics of, 215
La Plata, Lake, Patagonia, 356, 358
Lapparent, M. de, Rapport sur le projet de réfection de la Carte de France, 343 †
Las Heras river, Patagonia, 219, 261, 263
Last Hope inlet, South America, 255
Latitude—
Bericht über den Stand der Erforschung der Breitenvariation, von J. Albrecht, 344 †
Resultate aus den Polhöhenbestimmungen in Berlin, von Dr. Battermann, 344 †
Latuka tribe, 142, 143
Lauterbach, Dr., expedition to German New Guinea, 97
Lavieuville, G., et J. Pérard, Congrès International de Pêches Maritimes, etc., 587 †
Lecce, Trade of the Province of (Foreign Office Rep.), 454 †
Lechaptois, Mgr., journeys in the Fipa Plateau and Kukwa Plain, 666
Leclercq, J., Note sur le plus ancien entrepôt de commerce, 678 †
Lecomte, H., Influence des jardins d'essai, 234 †
Lee, Sidney, Dictionary of National Biography, 124 †
Lees, J. A., Peaks and Pines, 676 †
Lefèvre, Dr., Le Haut Laos, sa situation économique, 580 †
Leghorn, Trade of (Foreign Office Ann.), 454 †
Leiberg, J. B., Is Climatic Aridity impending on the Pacific Slope? 229 †; note on, 212
Leichhardt Expedition, The lost, 545
Leigh, J. G., The Samoan Crisis and its Causes, 122 †
Leipzig—
Geographische Lage und Entwickelung Leipzigs, von Dr. K. Hassert, 453 †
Leitner, Dr. G. W. (Biography), 346 †
Le Messurier, Colonel, remarks on "Travels in Bokhara," 619
Leonhard, Dr., Die Insel Kythera, 223 †; Originalkarte der Insel Kythera, 126
Leroux, A., Le Massif Central, 330 †
Le Roy, M., Les Pygmées-Négrilles d'Afrique, 227 †
Leroy-Beaulieu, P., Le Transsaharien, 228 †
Lessar, M., remarks on "Travels in Bokhara," 618
Leverett, F., Pleistocene Features and Deposits of the Chicago Area, 584 †; The Water Resources of Indiana and Ohio, 340 †
Libau, Kaiser Alexander III. Harbour at, 676 †
Licitra, A., Studio su la Vita e su le Opere di G. B. Odierna, 589 †
Liddell, —, Trade of Roumania, 455 †
Lièvre, D., Promenades japonaises et coréennes, 225 †
Lightning—
And Electricity of the Air, by A. McAdie and A. J. Henry, 344 †
Zunahme der Blitzgefahr, von W. von Bezold, 233 †
Limari submarine river escape, 402
Limes, Roman, in South Germany, Dr. R. Gradmann on, 89
Linggatempel en andere oudheden op het Yanggebergte, door J. Kohlbrugge, 580 †
Lippmann, G., Sur la mesure absolue du temps, 344 †
Little, A., Two Cities: London and Peking, 346 †
Little, Mrs. A., China, 579 †; Intimate China, 334 †
Littlehales, G. W., The Navy as a Motor in Geographical and Commercial Progress, 237 †
Lituya bay, Alaska, 524
Livingstone Exhibition for the Promotion of Health of Travellers, 672
Livingstone's tree, Mr. Codrington's expedition to, 317, 444
Ljubeten in der Sara Planina, von C. R. v. Steeb, 332 †
Llopis, D. A., Estudios sobre el Canal de Nicaragua, 463 †
Lobb, R. P., The Coming Struggle for Persia, 680 †
Lóczy, Dr., Photographs of Transylvania, 592
Loegop or Masai tribe, 146
Loess—
Postglaciale Löss im St. Galler Rheinthal, von J. Früh, 578 †
Löffler, Dr., Die Geographie als Universitätsfach, 690 †
Lohmann, Dr., Untersuchungen über den Auftrieb der Strasse von Medina, etc., 345 †

Lohombo river, Central Africa, 818
Lokulu and Lohngela rivers, Central Africa, 444
Lokunje river, Cameroons, 665
Lolodorf, Cameroons, 664
Loios tribe, Shan States, 384
London—
London and Peking, by A. Little, 346 †
London's Water Supply, by W. Hunter, 113 †
Real Municipal Government for, by A. B. Ghewy, 113 †
Temperature, Extremes of, in London and Neighbourhood, by Mr. Symons, 113 †
Longitude—
Schlussrechnung bei der Längenbestimmung aus Monddistanzen, etc., von E. Geleich, 344 †
Lorié, J., Het Brongas in Nederland, 223 †
Loth, W. L., Kaart van Suriname, 590
Lourenço Marques and District, Trade of (Foreign Office Rep.), 583 †
Loysch, Ed., Die Orometrie der Hohen Tátra, 576 †
Luapula river, Mumbotuta falls on, 562
Lucas, W. A., Photographs of New Guinea, etc., 696
Luchu Islands, Photographs of, by W. J. Clutterbuck, 592; Life in the, by Dr. W. H. Furness, 225 †
Lüdeling, Dr. G., Ueber . . . der erdmagnetischen Störungen an Polarstationen, 346 †
Lugano, Lake, depth of, 441
Lugar, Captain, on cable fractures, 398, 400
Lugeon, M., L'origine du Chablais, 222 †
Lunéville, Repartition de la population dans l'arrondissement de, par M. Andriot, 222 †
Lushai hills, surveys in the, 314
Lyell, Sir Charles, on submarine river outlets, 412
Lyons Commercial Mission in China, Review on Report on, 652

M.

McAdie, A., and A. J. Henry, Lightning and Electricity of the Air, 344 †
Macalister, R. A. S., On an Ancient Settlement in the South-West of the Barony of Corkaguiney, 333 †
Macalister, S., Survey of ruins of settlement in Kerry, 658
McClymont, J. R., The Discovery of New Guinea by Antonio D'Abreu, 463 †
Macdonald, A., Pioneering in Klondike, 229 †
Macdonald, Colonel, Expedition of, Notes on the Survey of, 202; Journeys to the North of Uganda, 129 *; Report on Expedition from Uganda, 680 †
McGee, W. J., National Growth and National Character, 466 †
Macgregor, Sir W., British New Guinea, Discussion and Annual Report, 231 †
Mach, R. von, Karte der Schulsphären der turkischen Balkan-Halbinsel, 126
Machat, J., Les Ressources économiques du Fouta-Djallon, 459 †
Mache country, 634
Mackinder, H. J., expedition to Mount Kenya, 93, 564; report on Geography at Oxford, 87
Maclaud, La Mission, A travers la Guinée et le Fouta-Diallon, 582 †, 664
Madagascar
Correspondence with the French Government respecting Madagascar, 118 †
Cultures au Brésil et l'avenir de Madagascar, par M. Conty, 228 †
Hovas et le peuplement de Madagascar, par M. Zaborowski, 337 †
Madagascar, by Lady Colvile, 228 †
Madagascar en 1893, par R. Jogan, 118 †
Mojunga, La Région de, 337 †
Malgaches, L'origine des, par E. Courtet, 228 †
Mission dans le Nord-Ouest de Madagascar, par V. Duruy, 337 †
Observations astronomiques . . . sur la côte occidentale de, par R. P. Colin, 118 †
Population du Haut-Bouéni, 228 †
Rapport d'ensemble du général Gallieni sur Madagascar, 682 †
Tamatave à Tananarive, La route de, par A. Durand, 228 †
Travaux géographiques et cartographiques exécutés à Madagascar, par a Grandidier, 682 †
Madras—
Government Museum. Anthropology, by E. Thurston, 579 †
Presidency, Report on the Administration of the, 225 †
Madre-de-Dios, Colonel Pando's and M. Villerobe's explorations on the, 214; The First Discovery of the, 447
Madrolle, C., A propos du chemin de fer français au Yunnan, 457 †
Maerker, Prof. J., Die geographischen Ursachen von Spaniens Niedergang, 112 †
Magagnosc, La grotte de, par C. Marcelin, 222 †
Magulia, etc., Bericht über eine Expedition nach, 583 †
Magelhan—
Descobrimento das Filippinas pelo navegador Portuguez Fernão de Magalhães, by G. Alberto, 466 †
Maggiore, Lake, depth of, 441
Magnetic Field of the Earth, The Secondary, by A. W. Rücker, 588 †
Magnetic Results at Greenwich and Kew discussed and compared, by W. Ellis, 345 †

Magnus, Dr., Zur Siedelungskunde von Norwegen, 223 †
Maize and its Uses, by R. W. Dunham, 234 †
Makran, Surveys in, 313
Malabar and Coromandel coasts, Rivers of, 409
Malaria—
Treatment of Malaria and Blackwater Fever, by W. H. Crosse, 125 †
Ulteriori ricerche sulla malaria, del Grassi, Bignami, e Bastianelli, 347 †
Malay Archipelago—
Federated Malay States, Report of the, 581 †, 662
Geologic Structure of the, by B. Kotô, 580 †
Life in the Malay Peninsula, by H. Clifford, 580 †
Maldonado's discovery of the Madre de Dios, 447
Malta—
Despatch, Copy of a, addressed to the Secretary of State for the Colonies by Sir A. L. Fremantle, 676 †
Malverns, Southern, Geological Structure of the, by Prof. T. T. Groom, 332 †
Mamaidi, Niger Protectorate, 181
Mammals, The Geography of, by W. L. and P. L. Sclater, 123 †
Man and his Work, by A. J. and F. D. Herbertson, 588 †
Man, Past and Present, by A. H. Keane, 124 †; note on, 449
Manchuria, Notes of a Tour in "No Man's Land," by R. T. Turley, 292 *
Manen, Léopold, par G. Héraud, 346 †
Manfredi, P., Nuova Carta della regione ad Oriente del Mar Morto, 116 †
Manila—
Manila under the Americans, by Captain Simonds, 581 †
Stimmungsbilder aus Manila, von Major von Sonnenburg, 581 †
Manimani district, Central Africa, 136
Manzi, A., Quello che ho Veduto al Parà, 684 †
Maperi valley and river, Bolivia, 16
Map-making, the Science of, Mr. Gannett on, 450
Map projections—
Vergleichung einiger Abbildungen eines kleinen Stücks der ellipsoidischen Erdoberfläche, Von E. Hammer, 344 †
Map Slides for educational purposes, produced by Mr. Dickenson and Mr. Andrews, 672
Maps—
Construction of Maps, Data for the, 543
Guide to Recent Large-scale Maps, etc., by A. Knox, 237 †
Natural Scale for Maps, 543
New Light on some Mediæval Maps, by C. R. Beazley, 620 *
Orthography, etc., of Names for the National Maps, by H. T. Crook, 691 †
Maps—*continued.*
Population Maps, 543
World on the Scale of 1 : 1,000,000 .. 543
Maps, New—
Africa, 126, 349, 469, 694
America, 126, 239, 349, 469, 590, 695
Asia, 126, 238, 348, 468, 693
Australasia, 127, 469, 695
Charts, 127, 239, 349, 469, 591, 695
Europe, 125, 237, 347, 467, 590, 691
General, 127, 239, 349, 469, 590, 695
Maquet, M., L'Engadine, le Massif de la Bernina, 224 †
Maragha, Marble quarries at, 517
Maravilla, Lake, Patagonia, 256
Marcel, M., Discovery of Old Geographical Documents in Switzerland, 216; Note sur une Mission géographique en Suisse, 235 †
Marcelin, C., La grotte de Magagnosc, 222†
Marchand, Le Retour de, par G. Demanche, 336 †
Marcillac, J. de, Les Chemins de fer en Chine, 457 †
Marco Polo—
Influence of, on Gastaldi's Maps of Asia, by Baron A. E. Nordenskjöld, 466 †; Zur Erinnerung an, von Dr. E. Schäfer, 235 †
Marine Deposits on the Ocean-floor, 431
Marine Faunas of the Arctic and Antarctic Regions, On a supposed resemblance between the, by D. W. Thompson, 588 †
Marinelli, O., Spostamento della foce del Simeto, 331 †; Studi orografici nelle Alpi orientali, 109 †
Markham, Sir C.—
Address to the Royal Geographical Society, 1 *; Opening Address, Session 1899–1900 .. 593
Antarctic Expeditions, 473 *
Memorandum on Wiche's Island, 177
Remarks: at Anniversary Dinner, 107; "Explorations in the Bolivian Andes," 31, 33; "Explorations in Patagonia," 374, 377; "Journeys to the North of Uganda," 152, 155; National Antarctic Expedition, 193, 199; presenting medals, 102, 103; "Travels in Bokhara," 619
Marocco—
Expeditions: Dr. Weisgerber's, 564; Dr. Fischer's, 209
Geology of Southern Morocco and the Atlas Mountains, by the late J. Thomson, 337 †
Moorish Empire, The, by B. Meakin, 682 †
Photographs of, by W. Hind Smith, 239
Reisen im Marokkanischen Atlas, von Dr. Fischer, 228 †
Marr, J. E., Development of British Scenery, 333 †
Marseilles—
Études sur Marseille et la Provence, 222 †

Marshall, W. W., The Importance of Sea Power, etc., 689 †
Martel, E. A., on underground rivers, 404
Martineau, G., The Statistical Aspect of the Sugar Question, 346 †
Marvin, C. F., The Use of Kites in the Exploration of the Upper Air, 345 †
Maryland, Labadist Colony in, by B. B. James, 584 †
Masai tribe, 146, 147
Matese, Il lago del, by G. de Agostini, 111 †
Mathew, J., Eaglehawk and Crow, a Study of the Australian Aborigines, 685 †
Mathews, R. H., Divisions of Queensland Aborigines, 231 †; Australian Divisional Systems, 685 †
Matthew, G., and S. W. Kain, On Artesian and Fissure Wells in New Brunswick, 461 †
Mau plateau, British East Africa, 275, 276
Maunoir, Ch., Rapport sur les travaux de la Société de Geographie, etc., 691 †
Maurer, Dr., observations for latitude, etc., in Kilimanjaro region, 321
Mauritius, Sugar Industry of, by J. F. Anderson, 118 †
Maxse, Major, remarks on "Journeys to the North of Uganda," 153
Mayer river, Patagonia, 264
Mayo river, Patagonia, 356
Mayon, Eruption of, Father Coronas' account of, 92
Mayumbe, Le, par M. Vanden Plas, 336 †
"Mazzagua" corn, 630 *note*
Mbinzau peak, British East Africa, 279
Meakin, B., The Moorish Empire, 682 †
Measures—
  Ancient Standards of Measure in the East, by Sir C. Warren, 465 †
  Uniformity in, 544
Mecca, Burton's Pilgrimage to, 334 †
Medals, etc., of R.G.S., presentation of, 102
Mediterranean—
  Admiralty Surveys in the, 85
  Pilot, The, vol. iii., 675 †
  Physical Conditions of the Mediterranean Basin, by Prof. Hull, 455 †
Meetings of the R.G.S., Session 1898–99.. 102, 220, 329; Session 1899–1900.. 673
Mehlis, Dr., Glaciale Erscheinungen vom Hartgebirge, 223 †
Meinecke, G., Siedelung in den Tropen, 466 †
Mekong river, 384, 385
Melin, Atlas, Historique et Géographique, par A. Paris, 127
Mellier, E., Projet d'utilisation de la grotte de Goule-Noire, 330 †
Melville, Commander, plan for drift-casks for arctic currents, 327
Men and Women of the Time, by V. C. Plarr, 689 †
Meng Lung and Meng Cheh, Shan States, 381
Mercantile Marines—
  Flottes de commerce et le trafic maritime, par A. Huni, 234 †
Mercier, G., L'expansion de la France dans le sud Algérien, 680 †
Merian, A., The Seychelle Islands, 225 †
Mersey River, Report on Navigation of the, by Sir G. Nares, 578 †
Mertens, Dr. A., Der Hopfenbau in der Altmark, 577 †
Meteorological Charts of the Southern Ocean, 695
Meteorological Council, Report of the, 333 †
Meteorological Extremes—Pressure, 465 †
Meteorological Observations at Sea, Value of, by W. C. Hepworth, 233 †
Meteorology—
  Einzelbeobachtungen vom Ozean anzustreben? von Dr. Köppen, 344 †
  Weather Bureau Officials, Proceedings of the Convention of, 587 †
Metis, volcanic island, 85
Mexico—
  Picturesque, by Marie R. Wright, 120 †
  Romero, M., work on, 94
  Sinaloa; un des États-Unis du Mexique, par M. Schœnfeld, 229 †
Meyer, Dr. Hans, Die Gletscher des Kilimandjaro, 118 †; Barometrische Hohenmessungen am Kilimandjaro, 681 †
Meyer, Dr. Hermann, journeys in Central Brazil, 324; über seine zweite Reise in Central-Bresilien, 341 †
Meyer's Hand-Atlas, 239, 349, 469, 591, 695
Miandab town, 519
Michelet—
  Comment Michelet est devenu historien et géographe, par L. Drapeyron, 235 †
Michigan, Lake, Ecological Relations of the Vegetation on the Sand-dunes of, by H. C. Cowles, 683 †; note on, 668
Migration, Phénomène de la, par E. Van den Broeck, 123 †
Military Geography, Methods of, Prof. Barré on, 672
Mill, Dr. H. R., Prof. Davis on Physical Geography, 183; on underground rivers, 404; on terminology of sub-oceanic reliefs, 550; review on Bartholomew's Physical Atlas, 649; The International Geography, edited by, 691 †; review on, by Major Darwin, 656
Mille, P., Colonies juives et allemandes en Palestine, 116 †
Miller, Prof., Mappæmundi edited by, 620
Minas Geraes, A Journey to the Diamond Fields of, 120 †
Mineral Resources of the United States, 340 †
Mine-surveying Instruments, The Evolution of, by D. D. Scott, 344 †

Mines and Quarries, General Report and Statistics, 333 †
Minnesota, Distribution of the Keewatin in, by Prof. C. Hall, 684 †
Mischlich, Dr., on the Harmattan wind, 445
Missionary Reports—
Free Church of Scotland, Report on Foreign Missions, 691 †
Propagation of the Gospel in Foreign Parts, Report of Society for the, 589 †
Mississippi, Problem of the, by H. Haupt, 120 †
Misti mountain, Bolivia, 24
Moën and Rügen, Chalk and Drift in, by Prof. Bonney and Rev. E. Hill, 674 †
Moguez, E. H., La Crète Autonome, 455 †
Mohawk Valley, Topography and Glacial Deposits of, by A. P. Brigham, 584 †
Mohn, Prof. H., Das Hypsometer als Luftdruckmesser, 464 †; Klima-Tabeller for Norge, 112 †; map of King Charles Land, 69
Mokpo, port, Korea, 561
Molesworth, Sir G. L., Photographs of British East Africa, etc., 352; Sir G., Report on the Uganda Railway, 209, 338 †
Monaco—
Musée océanographique de Monaco, 345 †
Monaco, Prince A. de, Exploration océanographique aux régions polaires, 343 †
Monnier, Auf den, von Dr. Mader, 330 †
Montana—
Granites of Carbon County, by J. P. Kimball, 584 †
Judith, Mountains of, Geology . . . of the, by Weed and Pirsson, 340 †
Montañas, Canal de las, 255
Mont Blanc—
Recherches géologiques . . . sur le massif du Mont Blanc, par MM. Duparc et Mrazec, 222 †
Montenegro, Botanischen Reise nach, von B. Horák, 112 †
Mont-Saint-Michel, Bay of, Transformations in the, 204
Moore, J. E. S., soundings in Lake Nyasa, 319
Moravia—
Holsteiner Thal; eine Karststudie aus Mähren, von R. Trampler, 576 †
Moravian Missions, Periodical Accounts, 237 †
Moreing, C. A., An All-British Railway to China, 678 †
Moreno, Dr. F., Explorations in Patagonia, 241 *, 353 †; letter from, on Dr. Steffen's explorations in South America, 219
Morocco: *see* Marocco
Moroto mountain, Central Africa, 136
Morphology of the Tian Shan, Dr. Friederichsen on, 661
Morris, D. B., Geography of the Forth Valley, 333 †
Morris, Prof., Terra Australis Incognita, 586 †
Morton, Captain, on cable fracture off Pescadores point, 400
Moscow—
Observations faites à l'observatoire météorologique de l'Université Impériale de Moscou, 224 †
Moseley, L. H., Regions of the Benue, 630 *
Moshi, The Loss of, 682 †
Mountaineers, The Early, by F. Gribble, 347 †
Mountains—
Gebirgsbildung im paläozoischen Zeitalter, von Dr. F. Frech, 587 †
Moxly, Rev. J. H., The Tides simply explained, 123 †
Mozambique and Quilimane, Trade of (Foreign Office Ann.), 583 †
Muani, East Africa, 272
Mudge, E. H., Mouth of Grand River, 584 †
Muir glacier, Alaska, 525
Müller, Dr., Die Südarabische Expedition . . . des Grafen Carlo Landberg, 333 †
Müller, F., Remarkable Maps of the fifteenth, sixteenth, and seventeenth centuries, 127; The Sacred Books of the East, 589 †
Muller, G., Neuer Verkehrs-Plan von Gross-Berlin, 691
Munchi country and tribe, Benue district, 634, 635
Muri state, Benue region, 631
Muroni river valley, British East Africa, 308
Murray islands, Torres Straits, 304, 305
Murray, J., A Handbook of Rome and the Campagna, 111 †; ditto of Warwickshire, 113 †; ditto of Hampshire, 113; ditto of Somerset, 332 †; Handbook for Residents, etc., in Wilts and Dorset, 677 †
Murray river, Filtration of, 408
Murray, Sir John, Address to the Geographical Section of the British Association, 688 †; Oceanography, 426 *; on material of sea-bottom off Cape Verde, 403; on the Temperature of the Floor of the Ocean, etc., 34 *; remarks on receiving American Medal, 105
Musset, M., Les Rochelais à Terre-Neuve, 461 †
Mweru, Lake, Photographs of country in neighbourhood of, by D. Crawford, 352
Mysore, Gazetteer compiled for Government, by B. L. Rice, 115 †

N.

NAHUEL-HUAPI, Lake, Patagonia, 359, 364
Nakhar pass, Caucasus, 660

Nandi country, British East Africa, 277
Nangiya-Solian range, 140
Nankin d'alors et d'aujourd'hui, par P. L. Gaillard, 679 †
Nantucket, a Morainal Island, by Curtis and Woodworth, 340 †
Nasa, T., Harbours of Japan, 115 †
Natal Frontier, Philips' Military Map of Seat of War on the, 694
Nathorst, Prof., Förslag till en expedition till östra Grönland, 343 †; Några upplysningar till den nya Kartan öfver Beeren Eiland, 464 †; The Swedish East Greenland Expedition, 97, 534; The Swedish Arctic Expedition of 1898 .. 51 *, 155 *, 686 †
National Growth and National Character, by W. J. McGee, 466 †
Nautical Almanac, The American Ephemeris and, 232 †, 464 †
Nautical Astronomy, Simplification of Formulæ in, by H. B. Goodwin, 586 †
Navy, The, as a Motor in Geographical and Commercial Progress, by G. W. Littlehales, 237 †
Nazlu Chai, Lake Urmi region, 506
Neger, Dr., Die botanischen Ziele der Südpolar-Forschung, 343 †; note on, 448
Nemensha country, Algeria, M. Blazac on the geography of, 208
Nerad, S. F., Vztah poloostrova Apenninského ku Balkánskému, 224 †
Nery, Baron de Santa-Anna, Le Pays des Amazones, l'El-Dorado, les Terres à Caoutchouc, 585 †
Netherlands, Reading List on the, by E. G. Thorne, 331 †
Neumayer, Prof. G., Biographical Sketch of, 589 †
Nevins, J. B., Geographical Picture of Mediæval Europe, 110 †
New Britain Islands, Herr Schnee's visit of inspection to the, 570
New Brunswick—
Artesian and Fissure Wells in, by G. Matthew and S. W. Kain, 461 †
"Dip" of the Magnetic Needle in, by Prof. Duff, 338
Natural History, etc., of, Notes on the, by W. F. Ganong, 460 †
Raised Peat-Bogs in, by W. F. Ganong, 119 †
New Caledonia—
Situation économique de la Nouvelle-Calédonie, par A. Jouannin, 342 †
Trade of (Foreign Office Rep.), 463 †
New England, Reading List of, by M. C. Wilson, 340 †; Glacial Wash-Plains of Southern, by J. B. Woodworth, 684 †
Newfoundland—
Admiralty surveys off, 84
Connection of England with, by Sir W. Des Vœux, 683 †
Pêche de la morue sur le grand banc de Terre-Neuve, par A. Bellet, 461 †
Newfoundland—*continued.*
Rochelais à Terre-Neuve, par M. Musset, 461 †
New Guinea—
Chez les Papous, par R. P. Jullien, 685 †
Discovery of, by Antonia D'Abreu, by J. R. McClymont, 463 †
German, Dr. Lauterbach's expedition to, 97
Kaiser-Wilhelmsland, Ueber, 585 †
Vegetation of, Notes on, by F. M. Bailey, 463 †, 585 †
New Light on some Mediæval Maps, by C. R. Beazley, 620 *
New Orleans, Trade of (Foreign Office Rep.), 120 †
New Siberia islands, Russian expedition to, 327
New South Wales—
Aboriginal Carvings of Port Jackson, by W. D. Campbell, 463 †
Artesian Water in, by J. W. Boultbee, 686 †
Historical Records of, by F. M. Bladen, 585 †
Jenolan Caves and Blue Mountains, by Argus, 686 †
Lands, Department of, Annual Report, 121 †
Mines and Agriculture, Department of, Annual Report, 121 †; Notes on the Occurrence of Bismuth Ores in, by J. A. Watt, 121 †
Rain, etc., Observations made in, by H. C. Russell, 463 †
Statistical Register, 463 †
Trigonometrical Survey of, etc., by T. F. Furber, 463 †
Wyalong Gold Field, Report on the, by J. A. Watt, 463 †
New York—
Glacial Lakes in, by H. L. Fairchild, 120 †
Juvenile Asylum, Anthropological Investigations on . . . children of the, by Dr. A. Hrdlicka, 461 †
State, Physical Geography of, by R. S. Tarr, 120 †, 229 †, 584 †
New Zealand—
Sketch of the New Zealand War, by M. S. Grace, 686 †
Statistics of the Colony of, 463 †
Westport Harbour in, Wave Basin, by T. H. Rawson, 464 †, 686 †
Ngami-Land, Reisen im, von Dr. Passarge, 228 †, 311, 312
Nicaragua—
American Interoceanic Canal, The Proposed, by J. Nimmo and E. Johnson, 685 †
Estudios sobre el Canal de Nicaragua, par A. Llopis, 463 †
Nicaragua and the Isthmian Routes, by A. P. Davis, 462 †
Nicaragua Canal Route, by Dr. C. W. Hayes, 685 †
Nicaragua-Kanal, Vom, von Dr. Polakowsky, 121 †

Nicaragua—*continued.*
Physiography of the Nicaragua Canal Route, by C. W. Hayes, 463 †
Nichols, H. W., The Ores of Colombia, 684 †
Niger—
Bassin du, 337 †
Boucle du Niger, Mission Blondiaux, 118 †
Chemin de Fer de Conakry au Niger navigable, par Captain Salesses, 118 †
France dans la Boucle du Niger, par M. Voulet, 227 †
French Niger Territory, 118 †
Future of the Niger, by F. A. Edwards, 460 †
Railway, The French, 564
West African Frontier Force (Colonial Reports), 460 †
Nigeria, A Glance at, by H. Bindloss, 682 †
Nile—
Barrage on the, 663
Grands travaux en cours d'exécution dans la vallée du Nil, par J. Brunhes, 336 †
Nile Flood, 1892, by W. E. Garstin, 227 †
Survey of the, Proposed, 227 †
Upper, Swamps of the, 208
Nilsson, H., Om . . . botaniska arbetena under Andrée-efterforsknings-expeditionen till Sibirien, 581 †
Nitche, Dr. R. L., on the Guayakis of Paraguay, 567
Njemps to Marich, Save, and Mumia's, From, by Major Austin, 307
Nkata bay on Lake Nyasa, longitude of, 667
"No Man's Land," Manchuria, 292, 293
Nordahl, B., In Nacht und Eis, Supplement, Wir Framleute, 231 †
Nordenskjöld, Baron A. E., The Influence of Travels of Marco Polo on Gastaldi's Maps of Asia, 466 †
Nordenskjöld, O., En expedition till Klondike, 120 *; Ueber einige Erzlagerstätten der Atacamawüste, 684 †
Nordenskjöld's Periplus, von K. Kretschmer, 235 †; by F. Wieser, 689 †
Nordmark, Geologisk Beskrifning öfver, af W. Petersson, 676 †
Norrland—
Praktiskt Geologiska Undersökningar inom Vesternorrlands, 676 †
North Sea—
Pilot, Supplement, 455 †
Tidal Currents of the, by A. Buchan, 588 †
Tidal streams of the (charts), 351
Norway—
Fortsatte Bidrag til Nosdmændenes Anthropologi, af C. Arbo, 112 †
Klima-Tabeller for Norge, af H. Mohn, 112 †
Lebermoosflora Norwegens, von Kaalaas, 112 †
Mountaineering in Arctic Norway, by W. C. Slingsby, 223 †
Norway—*continued.*
Norway, Sweden, and Denmark, Handbook for travellers, by K. Baedeker, 224 †
Pêche en Norvège, par J. Pérard, 331 †
Siedelungskunde von Norwegen, von Dr. Magnus, 223 †
Trade of (Foreign Office Rep.), 455 †
Nourse, T., Les pêcheries de la Vénétie, 675 †
Nova Scotia, Studies in the Gold-Bearing States of, by J. E. Woodman, 461 †
Novaya Zemlya—
Kalksteinfauna des Cap Grebeni, etc., von Th. Tschernyschew und N. Jakowlew, 455 †
Nüchter, F., Das Fichtelgebirge in seiner Bedeutung für den mitteleuropäischen Verkehr, 453 †
Nyasa, Lake, Depth of, Mr. Moore's soundings, 319; Lieut. Rhoades' longitudes of, 319; German scientific researches on, 94

O.

Oaxaca, Western, O. H. Howarth on, 669
Obituary list for 1898–99 . . 100
Obosomtwê, Le lac, par E. Perregaux, 117 †
O'Callaghan, Mr., remarks on "Roadmaking and Surveying in British East Africa," 290
Ocean—
Depths and Serial Temperature Observations of, List of, 465 †
Depths of the, 428; temperature, 429; marine deposits, 431; life on floor of, 433
Floor of the, On the Temperature of the, by Sir John Murray, 34 *, 587 †
Terminology and Nomenclature of Suboceanic Relief, 544, 550
Oceanic Circulation, The effect of Ice-melting on, 587 †; Oceanic Islands, Nomenclature of, 545
Oceanographic Research, Prof. Pettersson on Methods of, by H. N. Dickson, 185
Oceanographical Research, International Conference at Stockholm, 646
Oceanography—
Aräometer . . . im Altantischen und im Stillen Ozean, von Dr. Krämer, 688 †
Australasian Association for the Advancement of Science, Address by Sir J. Hector, 466 †
British Association, Address to the Geographical Section of the, by Sir J. Murray, 688 †
Deep-Sea exploring expedition of the *Albatross*, by H. M. Smith, 688 †
Deutsche Tiefsee-Expedition, von Drs. Chun, Schott, und Sachse, 587 †
Examen de l'eau de mer puisée à différentes profondeurs, par A. Gautier, 587 †

Oceanography—*continued.*
Meeresbodens, Die tiefste Depression des, von O. Krümmel, 688 †
Oceanographische Forschungen, Berichte der Commission für, von Dr. Natterer und P. von Pott, 233 †, 587 †
Oceanography, by Sir J. Murray, 426 *
Oderstrom, Der, von A. Penck, 111 †
Odessa, Trade of (Foreign Office Rep.), 577 †
Odierna, G. B., Studio su la Vita di, by A. Licitra, 589 †
Odin et Rabilier, MM., Carte des parages de pêche du thon dans le golfe de Gascogne, 453 †
O'Dwyer, M. F., Agrarian Conditions under British and Native Rule, 334 †
Oehlmann, Dr. E., L'Asie Mineure au point de vue de l'emigration allemande, 579 †
Oetscherhöhlen, Untersuchungen in den, von Profs. Crammer und Sieger, 221 †
Oldham, H. Yule, report on Geography at Cambridge, 88
Oldham, R. D., A Note on the Allah-bund in the North-West of the Rann of Kuchh, 458 †
Olkhon and the Buriats, 116 †
Olufsen, Lieut, expedition to the Pamirs, 561
Omaha tribe, A Study from the, by A. C. Fletcher, 340 †
Omo river, Lake Rudolf, 151
Ophir, The Ancient, letter from Mr. Wilmot on, 220
Opium trade in the Shan States, 390
Oppenheim, Dr., Vom Mittelmeer zum Persischen Golf, 117 †
Oppenheimer, Sir C., Trade of Frankfort-on-Main, 453 †
Oppermann, E., Erklärung geographischer Namen aus der Südpolarwelt, 231 †
Ordnance Survey Charts of England and Wales, 125, 237, 318, 467, 590, 691; Ordnance Survey Tidal Observations, 571, 578 †
Oregon, Idaho, and Washington, Trade of (Foreign Office Rep.), 584 †
Organisation d'un voyage d'exploration, par J. Dybowski, 347 †
Orgãos, O "Muricy" da Serra dos, pelo Dr. Huber, 462 †
"Osma" early maps, 623
O'Toole, Rev. H., An Improved Form of Hydrometer, etc., 233 †
Ötsuji Coal-fields in Ongo, by J. Suzuki, 580 †
Oxford, Geography at, Mr. Mackinder's report on, 87
Oxford School of Geography, 2, 82; programme of, 559
Oxus river, 618

P.

Pacific—
Admiralty surveys in the, 85
Albatross exploring expedition in the, 215
Charts of the (India-rubber, Gutta-percha, and Telegraphs Works), 469
Exploring Expedition to the Mid-Pacific Ocean, by Dr. H. Smith. 588 †
Jesup North Pacific Exploration, 96; Field Work of the, 347 †
Température . . . de l'océan Pacifique, par J. Girard, 123 †
Temperatures of the, 38, 39, 40, 45
Pacific Islands—
Photographs of New Guinea, etc., by W. A. Lucas, 696
Studien und Beobachtungen aus der Südsee, von J. Graf Pfeil, 686 †
Pacific Slope—
Is Climatic Aridity impending on the Pacific Slope? by J. B. Leiberg, 229 †
Redwood Forest of the, by H. Gannett, 229 †
Pai I, or Shans, 382
Paine, Mount, Patagonia, 256
Pakhoi, Trade of (Foreign Office Rep.), 457 †
Palacky, Dr. J., The geographical distribution of turtles, etc., 123 †
Palazzo, L., Carte magnétique de la Sicile, 454 †; Misure magnetishe eseguite in Italia, 454 †
Palena river, Patagonia, 360
Palestine—
Colonies juives et allemandes en, par M. Mille, 116 †
Pali and Mamaida, Notes on a Journey to, by P. A. Clive, 117 *
Palique mountain, Patagonia, 258
Pamirs—
Den anden danske Pamir Expeditions, ved Premierløjtnant Olufsen, 561, 334 †
Pamir Boundary Commission, Proceedings of the, by Lieut.-Colonel Henry Trotter, 334 †
Pando, Colonel, explorations on the Madre-de-Dios, 214
Pan-kiang river, 640
Para—
Album do Pará, do Dr. H. Santa Rosa e F. A. Fidanza, 585 †
Quello che ho Veduto al, by A. Manzi, 684 †
Paraguay—
Guayakis of, Dr. R. Lehmann on the, 567, 685 †
República del Paraguay, por M. G. Jove, 463 †
Trade of (Foreign Office Rep.), 463 †
Paranà, Prozetto per un' impresa di Colonizzazione nello Stato del, by L. Tonissi, 462 †

Paris, A., Atlas Melin, 127
Parsoné, E. W., on cable fractures off Pescadores point, 401
Parsons, Colonel, The Eastern Sudan, 459 †
Partsch, Josef (Biography), 235 †
Passarge, Dr. S., Die Besitzergreifung des Hinterlandes von Kamerun, 337 †; Reisen im Ngami-Land, 228 †; journeys in South Africa, 310
Patagonia—
A travers la Patagonie, par H. de la Vaulx, 585 †
Erforschung des Rio Yelcho oder Futaleufu in West-Patagonien, von Dr. P. Krüger, 462 †
Expeditions in: Chilean, 568; Dr. Steffen's, 568; Dr. Krüger's, 324
Explorations in, by Dr. F. Moreno, 241 *, 353 *
Geological features, 366–367, 375; plateaus, 367; glaciers and ice-sheet, 368; pampean formation, 369; marine deposits, 369; fossils, etc., 370; Indians, 370–372; currents off coast, 376
Origin of name, letter from A. M. Robinson on, 673
Paterson, Major, photographs of Venezuela, 240
Patras, Trade of, etc. (Foreign Office Rep.), 111 †
Patterson, Rev. G., obituary notice of, 235 †; Supplementary Notes on Sable Island, 229 †; Termination of Sir Humphrey Gilbert's Expedition, 235 †
Paulitschke, P. (Biography of), Dr. Max Schoeller, 236 †
Payeur-Didelot, M., Deux ans et demi au continent Mystérieux, 228 †
Peaks and Pines, by J. A. Lees, 676 †
Peal, S. E., Ein Ausflug nach Banpara, 114 †
Pearson, H. W., The Botany of the Ceylon Patanas, 456 †
Peary, Lieut., Arctic Expedition of, 325, 448, 570
Péchy, E. v., von Josef Homolka, 235 †
Peek, Sir C. E., Rousden Observatory, Devon, Meteorological Observations, 677 †
Pemba—
Insel Pemba und ihre kleinen Nachbarinseln, von Dr. O. Baumann, 458 †
Penck, A., Der Illecillewaetgletscher im Selkirkgebirge, 119 †; Die Pole der Landoberfläche, 233 †; on the Pole of the Land hemisphere, 98
Peneplain, The, by W. M. Davis, 344 †
Pérez, A. G., The Independence of Cuba, 230 †
Pernambuco, Trade of (Foreign Office Rep.), 462 †
Perregaux, E., Le Fétichisme, 235 †; Le lac Obosomtivé, 117 †
Perrott, C. H., Finland: an English Journal devoted to the Cause of the Finnish People, 455 †
Persia—
Coming Struggle for, by R. P. Lobb, 680 †
La Perse, par E. Reclus, 225 †, 335 †
Photogravures of, by Dr. Sarre, 472
Strategic Relation of Persia to British Interests, by Sir R. Temple, 581 †
Trade Routes, Mr. Hotz on, 91
Persian Gulf, Fresh-water springs in the, 409
Peru—
Diccionario Oriental del Peru, por Dr. C. Osambela, 585 †
Geographical and Statistical Synopsis of, 341 †
Itinerario de los viajes de Raimondi en el Perú, 585 †
Nouvelle mesure d'un arc de méridien, par M. Bourgeois, 685 †
Submarine river escape on coast of, 398
Trade and Finances of Peru for 1898 (Foreign Office Rep.), 585 †
Yauyos, Provincia de, por R. Rey y Basadie, 585 †
Pescadores point, Submarine river escapes off, 400, 401
Pestalozza, G., Notizie sull' Africa Orientale Tedesca, 118 †
Peters and Brooks, Messrs., expedition to Alaska, 322
Petersen, Dr. J., Beiträge zur Kenntniss der Bewegungsrichtungen des diluvialen Inlandeises, 123 †
Petherick, E. A., Edwards's Australasian Catalogue, 231 †
Petitot, E., De Carlton House au Fort Pitt, 119 †
Pettersen, Captain, map of King Charles Land, 72
Pettersson, Prof., on Methods of Oceanographic Research, by H. N. Dickson, 185
Peutinger, Table de, par Cap. Guyot, 235 †
Pfeil, Count, Studien und Beobachtungen aus der Südsee, 686 †
Pfister, C. (Biography of), J. V. Barbier, 124 †
Philip, G., Military Map of Seat of War on the Natal Frontier, 694
Philippines—
Archipiélago Filipino, 115 †
Baguios ó Ciclones Filipinos, por P. J. Algué, 335 †
Bevölkerung der Philippinen, von R. Virchow, 335 †
Birds, List of, etc., by D. C. Worcester and F. Bourns, 226 †
Economic Condition of the, by Max Tornow, 116 †
Filipinos als Herren im eigenen Hause, von F. Blumentritt, 226 †
Manila and the, by Major von Sonnenburg, 115 †
Manila under the Americans, by Captain Simonds, 581 †

Philippines—*continued*.
Maps: Carta General del Archipélago Filipino (U.S. War Department), 238
Meteorology in the, 581 †
Philippine Islands, by J. Ogawa, 680 †
Philippinen, Die, von N. Post, 115 †
Philippines and round about, etc., by Major Younghusband, 116 †
Philippines and their Future, 581 †
Philippines: L'insurrection de 1896–97, par C. de Lasalle, 581 †
Political, etc., History of the, by J. Foreman, 115 †
Stimmungsbilder aus Manila, von Major von Sonnenburg, 581 †
Wirthschaftliche Zukunft der Philipinen, 680 †
Photocol-Sammel-Atlas, Der, von Dr. Zimmerer, 236 †
Photogrammetrische Höhenmessen, von A. Freiherrn von Hübl, 344 †
Photographs—
Africa, British East, etc., by Sir G. Molesworth, 352
Baluchistan, British, etc., by G. P. Tate, 352
Caucasus, by M. de Déchy, 469
Hungary (Geographical Institute of the Royal Hungarian University), 470
Luchu Island, Great, by Mr. Clutterbuck, 592
Morocco, by W. W. Hind Smith, 239
Mweru, Lake, Neighbourhood of, by D. Crawford, 352
Pacific Islands, by W. A. Lucas, 696
Persia, by Dr. F. Sarre, 472
Sierra Leone and the Gold Coast, by W. S. Johnston, 240
Transylvania, by Dr. Lóczy, 592
Venezuela, by Major S. Paterson, 240
Physical Atlas, Bartholomew's, 590; review on, by H. R. Mill, 649
Phyto-geographical Terminology, 545
Pibor river, East Africa, 153
Picard, E., L'enseignement rationel de la géographie, 589 †
Pico de Paris and Pico del Indico, Bolivia, 31; Pico river, Patagonia, 358
Pigafetta, Primer viaje alrededor del mundo por el, traducción por M. Walls y Merino, 688 †
Pike, Mr., visit to King Charles Land, 75, 76
Pini, E., Spedizioni polari antartiche, 586 †
Pitard, E., Contribution à l'ethnographie du Valais, 224 †
Plants—
Géographie des plantes avec la physiologie pour base, par Ch. Flahault, 345 †
Plarr, V. C., Men and Women of the Time, 689 †
Pleyn, Dr., explorations in the Congo basin, 444
Plymouth and Neighbourhood, Plan of, by J. Bartholomew, 468
Plympton, C. W., Select Bibliography on Travel in North America, 339 †
Polakowsky, Dr. H., vom Nicaragua-Kanal, 121 †
Poland—
Sprawozdanie Komisyi Fizyograficznej, 329 †
Trade and Agriculture of Poland and Lithuania (Foreign Office Rep.), 577 †
Polar regions—
Befahrung der Meere hoher Breiten mit Hülfe von Eisbrechern, nach Admiral Makaroff, 343 †
Explorations océanographique aux régions polaires, par Prince Albert de Monaco, 343 †
Pole der Landoberfläche, von A. Penck, 233 †; note on, 98
Pole, South: *see* Antarctic
Polis, Dr. P., Anwendung . . . in au medicinischen Klimatologie, 687 †
Polynesians, Geographical Knowledge of the, by S. P. Smith, 589 †
Pomba, Cesare (Biography), 236 †; Pio Ricordo di, 589 †
Poncins, Vicomte E. de, Voyage au Choa, 118 †
Pontavice de Heussey, Comte du, remarks at Anniversary Meeting, 102, 107
Poole, R. L., Historical Atlas of Modern Europe, 126, 468
Population, Movement of, in Northern Baden, Dr. Carl Uhlig on, 89; Population of Unorganized Countries, 545
Porter, R. P., Industrial Cuba, 230 †
Porter, T. C., Impressions of America, 461 †
Portman, M., Notes on the Languages of the South Andaman Group of Tribes, 114 †
Porto Rico—
Reise-Eindrücke aus Puertorico, von Dr. Hübener, 685 †
Portuguese Colonies, by M. H. Barré, 237 †
Portuguese Discoveries on West Coasts of Africa, 665
Portuguese early maps of Java, 423
Post, N., Die Philippinen, 115 †
Preece, —, Trade of Ispahan and District, 581 †
Pringle, Captain, remarks on "Journeys to the North of Uganda," 152
Pritchett, Dr., Magnetic Survey of the United States, 339 †
Provence, In, by H. Lynch, 675 †
Prussia—
Philipponen in Ostpreussen, von Dr. Tetzner, 577 †
Polnischen Niederlassungen im Ruhrkohlenreviere, von T. Kellen, 111 †
Ueber die Moore des Königreichs Preussen, 111 †
Puerto Rico—
Military Map of (U.S. War Department), 239

Puget Sound, Some Coal-fields of, by B. Willis, 341 †
Pugh's Almanac and Queensland Directory, 231 †
Punjab—
Administration of the, Report, 225 †
Tribes and the Land of the, by Sir C. Roe, 115 †, 225 †
Purchas's account of Wiche's Land, 156
Pygmées, Les, Négrilles d'Afrique, par M. Le Roy, 227 †
Pyrenees—
Quelques lacs des Pyrénées, par Delebecque et Ritter, 112 †

Q.

QUEBEC, Surface Geology and Auriferous Deposits of, by R. Chalmers, 683 †
Queensland—
Charters Towers Goldfields, Geological Map of, 127
Divisions of Queensland Aborigines, by R. H. Mathews, 231 †
Early Exploration on the Logan, etc., by R. M. Collins, 122 †
Geology of Country round Stanthorpe, etc., by S. Skertchly, 122 †
Guide to, by C. S. Rutlidge, 686 †
Maps: Geological map of, by R. L. Jack, 469
Mesozoic Coal Measures of Stanwell, Report on the, by B. Dunstan, 464 †
Pugh's Almanac and Queensland Directory, 231 †
Surveyor-General, Report of the, 122 †
Quilleutes and Quinault tribes, 96
Quito, Arc of Meridian at, Re-measurement of the, 323

R.

RAGUNDADALENS Geologi, Om, af A. G. Högbom, 676 †
Railway Project for the Congo State, 211
Rain—
Distribution of, over the British Isles, by E. J. Symons and H. S. Wallis, 678 †
Monthly Rainfall over the Land Surface of the Globe, by A. J. Herbertson, 688 †
Ocean Rainfall by Rain-gauge Observations at Sea, by W. G. Black, 465 †
Rainier, Mount, Glaciers of, by Russell and Smith, 341 †
Rajna, M., Una discussione su l'Unificazione del Calendario, 586 †
Ramiefaser und die wirtschaftliche Bedeutung der Ramiekultur, von A. Schulte, 234 †
Ramsay, Captain, astronomical observations in Tanganyika region, 321
Ratzel, Dr. F., Anthropogeographie, 124 †; Korsische Städte, 577 †; La Corse, Étude anthropogéographique, 453 †
Ravenstein, E. G., The Climatology of Africa, 226 †; remarks on "Road-making and Surveying in British East Africa," 291
Rawson, T. H., Westport Harbour, New Zealand, 464 †
Recherche bay, Spitsbergen, 61
Reclus, E., La Perse, 225 †, 335 †
Reclus, O., Le Plus Beau Royaume sous le Ciel, 330 †
Red river, Shan States, 381
Red Sea—
Admiralty Surveys in the, 85
Oceanographische Forschungen im Rothen Meere, 233 †
Reed, J. H., Fashoda and the Bahr-el-Ghazel, 459 †
Reinecke, Dr., Zur Kennzeichnung der Verhältnisse auf den Samoa-Inseln, 464 †
Reuter, Dr. J. N., Russia in Finland, 112 †
Revelli, P., Il Viaggio in Oriente di Vitaliano Donati, 459 †
Rheinproving, Niederschlagsverhältnisse der Mittleren, von Dr. Polis, 675 †
Rhins, M. D. de, Mission in Central Asia, Final Results, 442
Rhoades, Lieut., longitudes of Lake Nyasa, 319
Rhodes—
Geologische Uebersichtskarte der Insel Rhodus, von G. von Bukowski, 455 †
Rhodesia—
Geodetic Survey of, 667
Rhodesia, 1889–99, 582 †
Southern: Orders in Council, 338; Précis of Information concerning, by Major Dawkins, 338 †
Travels and Researches in, by H. Schlichter, 458 †
Rhodesian Art, letter from Wm. Copeland on, 101
Ribaud, M., Japon historique et artistique, 115 †
Ricchieri, Prof.—
Colonizzazione e Conquista, 346 †
Di alcuni studi di storia della Geografia antica, 235 †
L'Italia in Cina, 456 †
Saggi di correzione dei nomi locali nelle carte topografiche . . . la Sicilia, 454 †
Rice, B. L., Mysore, A Gazetteer compiled for Government, 115 †
Richards, —, Trade of Damascus, 582 †
Richet, E., Rapport sur un projet d'expédition au Labrador, 119 †
Richter, Prof. E.—
Die Grönland-Expedition der Gesellschaft für Erdkunde in Berlin, 232 †
Neue Ergebnisse und Probleme der Gletscher-Forschung, 232 †
On Recent Glacier Investigations, 316
Stehende Seespiegelschwankungen auf dem Traunsee, 110 †
Rickmers, Mrs., remarks on "Travels in Bokhara," 617

Rickmers, W. R., Die Barren der Danduschka, 582 †; Der Uschba im Kaukasus, 116 †; Travels in Bokhara, 596 *; Ushba, 680 †
Rijnhart, M., journey in Eastern Tibet, 205; et Mme., Voyage de, dans le Tibet, oriental, 114 †
Rio de Janeiro, Trade of (Foreign Office Rep.), 462 †
Riouw- und Lingga-Archipel, 115 †
Ripley, W. Z., Selected Bibliography of the Anthropology and Ethnology of Europe, 576 †
Rivers—
 Clarification of River Waters, by A. Hazen, 128 †
 Development of, by S. S. Buckman, 113 †
 Development of River Branches, 490; Relation of River Ability and Load, 490; Development of River Meanders, 493
 Subterranean, 405–409
Road-making and Surveying in British East Africa, by Captain Smith, 269 *
Robinson, A. M., letter from, on origin of the name of Patagonia, 673
Rock-specimens, Petrographical Notes on, from Lake Urmi region, 521
Rocky Mountains of Canada, Letter from Prof. J. Norman Collie on, 100
Rodger, J. P., Selangor Administration Report, 679 †
Rödö—
 Om Rödöområdets, af P. J. Holmquist, 677 †
Roe, Sir C., Tribes and Land of the Panjáb, 115 †, 225 †
Roman "Limes" in South Germany, etc., Dr. Robert Gradmann on, 89
Romanow, P., Das gouvernement Tomsk, 116 †
Rome, Handbook of, by J. Murray, 111 †
Romero, M., work on Mexico, 94
Rosberg, J. E., Dynerna på Tauvonsaari, 332 †
Rosetti, E., Emilia e Romagna, 111 †
Rotch, A. L., Exploration of the Free Air by means of Kites, etc., 345 †
Rousden Observatory, Devon, Meteorological Observations made under superintendence of Sir C. E. Peek, 677 †
Rouville, P. G. de, Une leçon familière d'anatomie du globe terrestre, 234 †
Rovuma bay, Submarine river escape in, 397, 398
Rowten-Pot (Yorkshire), La descente de, 224 †, 658
Royal Geographical Society—
 Address, Opening, Session 1899–1900, by Sir C. Markham, 593
 Address to the, by Sir C. Markham, 1 *
 Anniversary Meeting, 102; Dinner, 107
 Meetings of, Session 1898–99..102, 220, 329; Session 1899-1900..673
Rozenraad, C., The Commercial Development of Germany, 110 †
Ruanda, Bericht über einen Zug nach, 583 †
Rubber plants of West Africa, Herr Schlechter on, 445
Rücker, Prof. A. W., remarks on the National Antarctic Expedition, 198
Rudolf, Lake, Captain Welby's explorations in region of, 318; Lake Rudolf, by Major Austin, 148 *
Ruge, Dr. W., und Dr. E. Friedrich, Archäologische Karte von Kleinasien, 348
Rukwa Plain, Mgr. Lechaptois' journey in the, 666
Rumania—
 Marele Dicționar Geografic al Romîniei . . . de G. J. Lahovari, 676 †
 Trade of (Foreign Office Rep.), 455 †
 Trebuinta de a se face cadastrul Românieĭ, de Gen. Brătianu, 455 †
Rumpe, Dr. R., Afrikas Angliederung an die europäische Culturwelt, 680 †
Russell, H. C., Current Papers, No. 3.. 465 †; Results of Rain, etc., Observations made in New South Wales, 463 †; Source of the Periodic Waves, etc., 232 †; Water-spouts on the Coast of New South Wales, 345 †
Russia(n)—
 Arctic Research, 327
 Colonisation russe dans les gouvernements d'Oufa et d'Orenbourg, par P. d'Almeida, 112 †
 Entwicklung der russischen Militär-Kartographie, von S. Truck, 332 †
 Explorations south of Abyssinia, 663
 Hydrographic Charts, 351, 695
 Notes of a Tour in, by Rev. A. Francis, 676 †
 Oceanographical work, 438
 Province of the North, by A. P. Engelhardt, 112 †
 Russische Norden und die Murman-Küste, von F. Immanuel, 331 †
 Tentamen Floræ Rossiæ, by S. Korshinsky, 112 †
Rutlidge, C. S., Guide to Queensland, 686 †
Ruwenzori, Visits to, by Rev. A. R. Tucker, 680 †

S.

Saba, West Indies, Submarine river escape off, 400
Sable Island, Supplementary Notes on, by Rev. G. Patterson, 229 †; To utilize Sable Island, by H. B. Small, 583 †
Sachse, W., Die Wiederauffindung der Bouvet-Insel, 458 †
Sacred Books of the East, edited by F. M. Müller, 589 †
Sahara—
 Eau dans le Sahara, par M. Lahache, 226 †
 Erg occidental, Sa traversée de l', par M. Flamand, 226 †

Sahara—*continued.*
Foureau-Lamy, La Marche de la Mission, par G. Demanche, 228 †, 336 †
Pénétration du Sahara par l'Algérie, par L. Kryszanowski, 336 †
Question du Transsaharien, par P. Combes, 582 †; ditto, par A. Bernard, 337 †
Transsaharien, Le, par P. Leroy-Beaulieu, 228 †
Saija, G., Sull' ellissoide terrestre, 343 †
St. Helena in ye olden tyme, by R. A. Sterndale, 118 †
St. John, —, Trade and Finances of Peru, 585 †
St. Lawrence—
Lachine Rapids, Temperature of the, by H. T. Barnes, 229 †
Sajama mountain, Bolivia, 25
Salesses, Cap. Le chemin de fer de Conakry au Niger navigable, 118 †
Salinas landing, Monterey bay, California, gully formation in, 412
Salomon, Dr., Gebieten des Adamello und des St. Gotthard, 221 †
Samoa—
Commercial Importance of, by O. P. Austin, 464 †
Kennzeichnung der Verhältnisse auf den Samoa-Inseln, von Dr. Reinecke, 464 †
Navigators Islands, by Commander H. Webster, 464 †
Samoan Crisis and its Causes, by J. G. Leigh, 122 †
Samoanische Königsfrage im Hinblick, von Dr. A. Krämer, 122 †
Valeur économique de Samoa, par D. Bellett, 464 †
Wirtschaftliche Lage auf, von Dr. Krämer, 686 †
Samshui, Trade of (Foreign Office Rep.), 457 †
San Cataldo di Bari, Stazione Astronomica a, by P. L. Cattolica, 464 †
San Clemente Island, Geological Sketch of, by W. S. Smith, 339 †
Sand-plain Formation, by M. L. Fuller, 688 †
Sandy point, Tierra del Fuego, 31
Sanga, Carte de la haute, et du territoire concédé à la Compagnie Sud-Kamerun, 336 †
San Joaquin River, Basin of the South Fork of the, by J. N. Le Conte, 229 †
San Martin Lake, Patagonia, 255, 262, 263
San-Moun, La Baie de, 456 †
Santa Cruz river, 251, 260
Santarem, A boz do Tapajós.. a agua subterranea na região de, pelo Dr. Katzer, 462 †
Santa Rosa, Dr., e F. A. Fidanza, Album do Pará, 585 †
São Paulo, Der Staat, und sein Landbau, von Dr. J. v. Siemiradzki, 230 †
Sapper, Dr. K., on the Physical Geography of Central America, 95
Sarawak, Four Hundred Miles in, by Rev. H. Gocher, 679 †
Sarmiento, Mount, Tierra del Fuego, 29, 30; Lake, 256
Sarre, Dr., Photogravures of Persia, etc., 472
Saskatchewan, Sources of the, by W. D. Wilcox, 120 †
Sattima peak, East Africa, 283
Scandinavia—
Om Skandinaviens Geografiska utveckling efter istiden, by G. de Geer, 577 †
Schäfer, Dr. E., Zur Erinnerung an Marco Polo, 235 †
Schardt, H., Les Préalpes Romandes, 109 †
Scharff, Dr. R. F., The History of the European Fauna, 576 †
Schattenplastik und Farbenplastik, von Dr. Heiderich, 122 †
Schirmer, H., Histoire de la découverte . . . des États du Soudan, 119 †
Schlechter, Herr, on the rubber plants, West Africa, 445
Schlegel, Prof. G., Geographical Notes, Ma-it—Ma-jëp-ung, 334 †
Schleswig—
Deutsche und Dänen in Nordschleswig, von P. Langhans, 223 †
Schlichter, Dr. H., Travels and Researches in Rhodesia, 458 †
Schloifer, Lieut., expedition to Lake Tanganyika, 566
Schnee, Herr, visit of Inspection in the New Britain Islands, 570
Schoeller, Dr. Max, von P. Paulitschke, 236 †
Schott, Dr. G., Von der deutschen Tiefsee Expedition, 345 †, 587 †
Schrader and Gerdine, Messrs., expedition to Alaska, 322
Schwabe, K., Mit Schwert und Pflug in Deutsch-Südwestafrica, 337 †
Scientific Literature, The International Catalogue of, 466 †, 467 †
Scientific Societies of Great Britain and Ireland, Year-Book of the, 347 †
Sclater road to the Victoria Nyanza, 278
Sclater, W. L. and P. L., The Geography of Mammals, 123 †
Scorpil, MM., Sources et Pertes des Eaux en Bulgarie, 110 †
Scott, D. D., Evolution of Mine-surveying Instruments, 344 †
Scurvy afloat, On the Decline of, by C. M. Beadnell, 589 †
Sea Barriers, Effect of, by J. F. Newsom, 688 †
Sea-Power and Sea-Carriage, by B. Taylor, 346 †; Importance of Sea-Power, etc., by W. W. Marshall, 689 †
Sea-routes—
Comparaison des deux routes d'Europe à San Francisco, etc, par P. Serre, 232 †
Seidel, H., Togo im Jahre 1897–98..337 †

Seismological Investigations, 345 †; Observations, International, 545; Phenomena in Australasia, 342 †
Seismology—
Riassunto della sismografia del terremoto del 1894, del A. Riccò, 588 †
Selangor Administration Report, by J. P. Rodger, 679 †
Semple, E. C., The development of the Hanse Towns, etc., 454 †
Serre, P., Comparaison des deux routes d'Europe à San Francisco, etc., 232 †
Servia, Trade of (Foreign Office Rep.), 112 †
Servigny, J., Les chemins de fer en Chine, 114 †
Seton, M., Britain in Africa, 336 †
Seton-Karr, W. S., Grant of Rothiemurchas, 689 †
Settlement, Ancient, in Kerry, Mr. Macalister's survey of, 658
Severn, The Genesis of the, by S. S. Buckman, 113 †; note on, 88
Seychelle Islands, The, by A. Merian, 225 †
Shaler, Prof. N. S., Reservoirs of the Cape Cod District, 340 †; The International Catalogue of Scientific Literature, 467 †
Shanghai, Trade of (Foreign Office Rep.), 679 †; to Bhamo through Hunan, Recent Journey from, by Captain Wingate, 689 *
Shan States, Chinese, A Trip to the, by F. W. Carey, 378 *
Shantung—
Gaedertz' journey in, 206
Rekognoszierungsreise in der Provinz Schan-Tung, von A. Gaedertz, 457 †
Schantung und Deutsch-China, von E. von Hesse-Wartegg, 679 †
Sharpe, A., expl ations at Lake Kivu and Albert Nya za, 662
Shashi country, German East Africa, 446
Shashih, Trade of (Foreign Office Rep.), 457 †
Shaw, Miss Flora, Klondike, 120 †
Shazalan Island and Hills, Lake Urmi, 515
Shehuen river, Patagonia, 262
Shoreline Topography, by F. P. Gulliver, 344 †
Shillinglaw, J. J., Notes on an Original Chart of the South and East Coasts of Tasmania, 686 †
Shin Ping Fu, Manchuria, 294
Shipley, M. A., Some more discoverers of their predecessors' discoveries, 338 †
Shipwrecks—
Ort und Ursache der Strandungen deutscher Seeschiffe, von J. Herrmann, 347 †
Shishaldin as a Field for Exploration, by J. Stanley-Brown, 583 †
Siam—
And its neighbours, by Hon. J. Barrett, 582 †
Avenir du Siam, 680 †
Siberia—
Botaniska Arbetena under Andrée-efterforsknings-expedition till Sibirien, af H. Nilsson, 581 †
Efterforskningarna efter Andrée-expeditionen i Sibirien, af J. Stadling, 582 †
Gebirge Nordsibiriens, von Hauptmann Immanuel, 335 †
Trans-Siberian Railway, by Lieut.-Colonel Waters, 116 †
Travaux de la Sous-Section Troitzkossawsk Kiakhta Section du pays d'Amour, 581 †
Wahrheit über Sibirien, von L. Studnicki, 335 †
Sicasica, ruined village near, 23
Sicily—
Carte Magnétique de la Sicile, par L. Palazzo, 454 †
Saggi di correzione dei nomi locali nelle carte topografiche . . . la Sicilia, del Prof. Ricchieri, 454 †
Spostamento della foce del Simeto, di O. Marinelli, 331 †
Sulle identificazione dei fiumi che scorrono presso Girgenti, etc., del Dr. Oliveri, 454 †
Sieger, Dr., Allgemeinen Transskription geographische Namen, 691 †
Sierra (Nevada), A neglected region of the, by L. Hutchinson, 120 †
Sierra Leone, Admiralty surveys in, 84; Protectorate Expedition, 583 †; Sierra Leone and the Gold Coast, Photographs of, by W. S. Johnston, 240
Sievers, W., Richard Ludwigs Reisen in Coro, 121 †
Sikh War, The First, by Lieut.-Colonel Sinclair, 114 †
Silk—
Sericulture and Silk Reeling from the Cocoons, 234 †
Silnitzky, A., La province d'Anadyr, 116 †
Simeto, Spostamento della foce del, di O. Marinelli, 331 †
Simmenthals, Die Krankheit im Volksglauben des, von Dr. H. Zahler, 578 †
Simony, Friedrich, Zur Biographie, von Dr. Böhm, 347 †
Simpson, Sir G., on glaciers of Alaska, 531, 532
Simpson, Wm., obituary of, 573
Sinai—
Where is Mount Sinai? by Prof. E. Hull, 458 †
Sinclair, Lieut.-Colonel, The First Sikh War, 114 †
Singer, H., Die Karolinen, 585 †
Sip Song Panna, Shan States, 378, 379
Sjögren, Mount, King Charles Land, 162
Skertchly, B. J., On the Geology of the country round Stanthorpe, etc., 122 †
Skrine, F. H., and E. D. Ross, The Heart of Asia, 336 †; note on, 560
Skrine, F. H., From London to Karachi in a Week, 680 †

Slatin Pascià nel Sudân Orientale, 459 †
Slingsby, W. C., Mountaineering in Arctic Norway, 223 †
Small, H. B., To utilize Sable Island, 583 †
Smith, Captain G. E., Road-making and Surveying in British East Africa, 269 *
Smith, Dr. H., Exploring Expedition to the Mid-Pacific Ocean, 588 †
Smith, H. M., Deep-sea exploring Expedition of the *Albatross*, 688 †
Smith, S. P., The Geographical Knowledge of the Polynesians, 589 †
Smith, W. Hind, Photographs of Morocco, 239
Smith, W. S., Geological Sketch of San Clemente Island, 339 †
Smyth's sound, Bolivia, 28
Snelson, Rev. F., Modern Bundooism . . . in Pagan Africa, 458 †
Sobat district and river, 153, 208
Society Islands, Trade of (Foreign Office Rep.), 585 †
Sodom und Gomorrha, Noch ein Wort über die Katastrophe von, von C. Diener, 226 †
Solomon Islands, Photographs of, by W. A. Lucas, 696
Somaliland—
Voyage au Choa, par Vicomte E. de Poncins, 118 †
Somerset, Handbook for Travellers in, by J. Murray, 332 †
Sonnblick-Vereines, Siebentes Jahres-Bericht des, 329 †
Sonnenburg, Major von, Manila and the Philippines, 115 †; Stimmungsbilder aus Manila, 581 †
Sorata, Mount, Bolivia, 15
Southampton, Antient, Catalogue of Works of Arts belonging to W. B. Hill, 677 †
Southampton Geographical Society's Report, 589 †
Southern Ocean, Meteorological Charts of the, 695
Southport, Fernley Observatory at, Report of Observations, by J. Baxendell, 578 †
Spain—
Geographischen Ursachen von Spaniens Niedergang, von Prof. J. Maeker, 112 †
Trade of (Foreign Office Rep.), 577 †
Spencer, Cape, Alaska, 526
Spitsbergen—
Exploration océanographique aux régions polaires, par Prince A. de Monaco, 343 †
Swedish Expedition to, 52
Stadling, J., Efterforskningarna efter Andrée-expeditionen i Sibirien, 582 †
Stainier, X., L'Age de la Pierre au Congo, 227 †
Stanford, E., Map of the South African Republic, 349; New map of the Orange Free State, etc., 694
Stanley, H. M., Honour to, 98
Stanley Falls, Le chemin de fer des, 226 †
Stanley, Une étude inédite de, 680 †
Stanley-Brown, J., Shishaldin as a Field for Exploration, 583 †; on Volcanoes of the Aleutian Islands, 567
Steeb, C. R. v., Der Ljubeten in der Sara Planina, 332 †; Die neueren Arbeiten der Mappierungs-Gruppe, 222 †
Steffen, Dr. J., expedition in Patagonia and Chili, 96, 568; letter from F. P. Moreno on, 219
Stein, A., Detailed Report of an Archæological Tour with the Buner Field Force, 458 †, 660
Stein, Baron von, work in the Southern Districts of the Cameroons, 664
Stein, Dr. R., Arctic Expedition of, 571
Stephens, E., The Tasmanian Half-Castes of the Furneaux Islands, 686 †
Sterndale, R. A., St. Helena in ye olden tyme, 118 †
Sterneck, R. v., Das neue Dreiecksnetz . . . oesterreichish-ungarischen, 221 †
Stevens, Sir C., The Port of Calcutta, 334 †
Stockholm, Conference for International Oceanographical Research, 646
Storfjord, Spitsbergen, 62
Strathdearn and the Aviemore Railway, Geological Notes on, by T. D. Wallace, 579 †
Stream Measurements, Report of Progress of, by A. P. Davis, 341 †
Streams, consequent, Development of, 487, 489
Streng, A. E., Djupkarta öfver Lojo sjö, 332 †
Struck, A., Wodena, 224 †
Studnicki, L., Die Wahrheit über Sibirien, 335 †
Sturdza, D. A., Lucrările Comisiunel Europeane a Dunărel, 452 †
Styrie, La Caverne de Ratelstein en, par C. Héréus, 221 †
Suakin, Trade of (Foreign Office Rep.), 459 †
Submarine Rocks, On the Geological Investigations of, by J. Joly, 233 †; Submarine gullies, etc., beneath the sea-level, by H. Benest, 394 †
Sub-Oceanic Physical Features off the Coast of Western Europe, On the, by Prof. Hull, 465 †; Sub-oceanic Continental Slope of North Atlantic, 327
Sudan—
Convention franco-anglaise, 338 †
Eastern Sudan, The, by Colonel Parsons, 459 †
Egyptian Sudan, Sir W. Garstin's report on the, 208
Equatorial Province, Notes from the, by A. D. Milne, 582 †
French Expeditions in the, 320
Histoire de la découverte . . . des États du Soudan occidental, par M. H. Schirmer, 119 †

Sudan—*continued*
  Mission chez Samory, par M. le Filliatre, 681 †
  Slatin Pascià nel Sudan Orientale, 459 †
  Soudan Français, par G. Vasco, 227 †
Südsee: *see* Pacific Islands
Suez Canal, Returns of Shipping and Tonnage, 336 †
Sugar Question, Statistical Aspect of the, by G. Martineau, 346 †
Sujbulak, Lake Urmi region, 520
Suk tribe and country, Central Africa, 132
Sulitelma und Ålmajalos, Gletscher von, von J. Westman, 676 †
Sumac, trade at, 391
Sumatra—
  Hausbau . . . den Battakern in Nordsumatra, von Dr. W. Volz, 335 †
Sunigram, ruins near, 661
Supan, Dr. A., Allgemeine Erdkunde als Anhang zur Deutschen Schulgeographie, 690 †; Die Bodenformen des Weltmeeres, 688 †; Die Hauptergebnisse der deutschen Tiefsee-Expedition, 231 †
Surface waters of the Ocean, temperature of the, 42
Suriname, Kaart van, door W. L. Loth, 590
Sverdrup, Captain, expedition in Greenland, 448, 571
"Swatch of no ground," Ganges mouth, 410
Swatow, Trade of (Foreign Office Rep.), 457 †
Swaziland—
  Geology of, by Prof. R. Jones, 118 †
Sweden—
  Maps: Sveriges Geologiska Undersökning, 348
  Observations Météorologiques Suedoises, 578 †
  Pression atmosphérique moyenne en Suède, par H. E. Hamberg, 676 †
  Svenska Turistföreningens Årsskrift, 392 †
  Trade of Stockholm and the Eastern Coast of Sweden for 1898 (Foreign Office Rep.), 670 †
  Urkalkstenarnas topografi och den glaciala erosionen, af A. G. Högbom, 577 †
Swedish Arctic Expedition of 1898, by Prof. Nathorst, 51 *, 155 *; Swedish East Greenland Expedition, by Dr. Nathorst, 534; Swedish Foreland, King Charles Land, 74, 161
Switzerland—
  Geographical Documents discovered in, 216
  Pluie en Suisse et à Genève, par M. Gautier, 224 †
Switzerland and the Adjacent Portions of Italy, Savoy, and Tyrol, 677 †
Sykes, Captain, award to, 104
Sykes, Mark, Narrative of a Journey east of Jebel ed-Druse, 116 †
Symons, G. J., Extremes of Temperature in London, etc., 113 †; and H. S. Wallis, British Rainfall, 678 †
Syria—
  Narrative of a Journey east of Jebel ed-Druse, by Mark Sykes, 116 †
  Nuova Carta della regione ad Oriente del Mar Morto, del P. Manfredi, 116 †
  Trade of Beirut and Coast of (Foreign Office Rep.), 582 †
Széchenyi, Graf, Reise des, in Ostasien, 114 †

T

Tabriz, Persia, 515
Taganrog and District, Trade of (Foreign Office Rep.), 577 †
Tahiti—
  Tahiti unter französischer Herrschaft, 342 †
Taku inlet, Alaska, 531
Talara, Peru, cable fractures at, 398
Tamerlan, Excursion à la capitale de, par E. Gallois, 116 †
Tanganyika, Lake, German steamer for, 566
Tangier and District, Trade of (Foreign Office Rep.), 460 †
Taraba river, Benue, 631
Tarr, Prof. R. S., Physical Geography of New York State, 120 †, 229 †, 581 †
Tasmania, Original Chart of the South and East Coasts of, by J. J. Shillinglaw, 686 †
Tatawa Chai, Lake Urmi region, 507, 519, 520
Tate, G. P., Photographs of British Baluchistan, etc., 352
Tatra—
  Orometrie der Hohen Tátra, von Ed. Loysch, 576 †
Ta Ya-Ku, Shan States, 386, 387
Taylor, B., Sea-Power and Sea-Carriage, 346 †
Taylor, C. M., The British Isles through an Opera Glass, 677; Vacation Days in Hawaii and Japan, 125 †
Taylor, Miss E., Up the Mackenzie River to the Polar Sea, 119 †
Tea trade and districts in the Shan States, 388
Teheran-Kum road to Ahwaz, 92
Tell-es-Safi and Tell Zakariya, Reports on Excavations at, by F. J. Bliss, 582 †
Tell Zakariya, First Report on the Excavations at, by F. J. Bliss, 116 †, 226 †
Temperature—
  British Mountain-tops, Minima of Temperature on, 315
  Floor of the Ocean, On the Temperature of the, by Sir John Murray, 34 *
  Lage der Isothermen von 0° C., von E. v. Edvi, 235 †
  Mean temperatures of the Antarctic, 417

Temperature—*continued*.
Zusammenhang der Temperatur, von L. Satke, 345 †
Temple, Sir R., The Strategic Relation of Persia to British Interests, 581 †
Terrestrial Magnetism—
Assumed Normal Magnetization, by L. A. Bauer, 234 †
Comparing and reducing Magnetic Observations, 345 †
Elemente des Erdmagnetismus, etc., von Dr. Fritsche, 345 †
Erdmagnetischen Inklination und ihrer Variationen, von H. Wild, 346 †
Erdmagnetischen Storüngen an Polarstationen, von Dr, Lüdeling, 346 †
Is the Principal Source of the Secular Variation of the Earth's Magnetism within or without the Earth's Crust? by L. A. Bauer, 234 †
Is there a 428 Day Period in Terrestrial Magnetism? by J. F. Hayford, 234 †
Probleme des Erdmagnetismus, etc., von M. Eschenhagen, 588 †
Secondary Magnetic Field of the Earth, by A. W. Rücker, 588 †
Secular Change in the Direction of the Terrestrial Magnetic Field, by G. W. Littlehales, 688 †
Sull' influenza . . . della componente orizzontale del magnetismo terrestre, del G. Bellagamba, 588 †
Vertical Earth-Air Electric Currents, by L. A. Baur, 588 †
Tertenia, Central Africa, 140
Tetzner, Dr., Die Philipponen in Ost-Preussen, 577 †
Thacher, J. B., The Cabotian Discovery, 235 †
Thermometer scales, Uniformity in, 544
Thesleff, A., Zigenarnes utbredning i Finland, 332
Thirring, Dr., Die Bevölkerungsverhältnisse der ungarischen Städte, 223 †; Statistisches Jahrbuch . . . Budapest, 111 †
Thompson, D. W., On a supposed Resemblance between the Marine Faunas of the Arctic and Antarctic, 588 †
Thomson, John, Through China with a Camera, 114 †
Thomson, Joseph, the late, Geology of Southern Morocco and the Atlas Mountains, 337 †
Thorndike-Nourse, M., Les valli de la Vénétie, 455 †
Thoroddsen, Dr., Explorations in Iceland, 331 †; Høglandet ved Langjökull paa Island Rejseberetning, 454 †
Thoulet, J., Carte bathymétrique de l'archipel des Açores, 329 †; Considérations relatives à la construction d'une carte lithologique des côtes de France 453 †, 692
Thuringia—
Maps: Geologische Spezialkarte von, 692
Thurston, E., Madras Government Museum, Anthropology, 579 †
Thury, C. de, Projet de jonction géodésique entre la France et l'Italie, 222 †
Tian Shan, Morphology of the, Dr. Friederichsen's study of the, 443, 661
Tibet—
Derniers Voyages dans le Tibet Oriental, par MM. Bonin et Grenard, 457 †
Eastern, M. Rijnhart's journey in, 205
Road Report of Route across Tibet and China, by Captain Wellby and Lieut. Malcolm, 457 †
Voyage de M. et Mme., Rijnhart dans le Tibet oriental, par F. Grenard, 114†
Tidal Observations round the Coast of England and Wales, 571
Tides simply explained, The, by Rev. J. H. Moxly, 123 †
Tientsin, par P. Bure, 579 †
Tierra del Fuego, 248, 249; mountain of, 29, 30
Tietkens, W. H., remarks on Central Australia, 463 †
Tilmant, V., Mémoire contre la division decimale du cercle, 122 †
Timber Line, The, by H. Gannett, 229 †
Timbo, Futa Jallon, 664
Time—
Decimal division of Time and Angles, 544
Heure et la Longitude Universelles, par E. Cugnin, 586 †
Sur la mesure absolue du temps, par G. Lippmann, 344 †
Unificazione del calendario, Una discussione su l', par M. Rajna, 586 †
Timur-Dera-Kul, Bokhara, 600
Tippenhauer, L. G., Geologische Studien in Haïti, 230 †
Tirah and the Bazar Valley, On the Geology of, by H. H. Hayden, 579 †
Titicaca, Lake, South America, 14
Tocantins et Xingú, Voyage entre, par H. Coudreau, 230 †
Togo—
Études sur les Colonies Allemandes, I. Togo, par H. Hauser, 460 †
Harmattanphänomen im, Ueber das, 227 †, 460 †
Togo im Jahre 1897-98, von H. Seidel, 337 †
Tomsk, Das gouvernement, von P. Romanow, 116 †
Tonga, Trade of (Foreign Office Rep.), 586 †
Tordenskjold, Mount, King Charles Land, 163, 164
Tornow, Max L., The Economic Condition of the Philippines, 116 †
Toro, Visits to Ruwenzori, by Rev. A. R. Tucker, 680 †
Torres Straits and Sarawak, Cambridge Anthropological Expedition to, 302
Tottie, C. D., Om fortgången af Europas allmänna topografiska kartarbeten, 452 †

Trafal, Lake, Patagonia, 365
Trampler, R., Das Holsteiner Thal, 576 †
Trans-Baikal, The, by H. Havelock, 582 †
Transcaspian Desert, The, 582 †
Transkaspien, Reiseskizzen aus, von G. Boehm, 336 †
Trans-Siberian Railway, by Lieut.-Colonel Waters, 116 †; ditto, by W. Durban, 680 †; at Lake Baikal, 317
Transvaal—
Le Transvaal, par C. Guy, 228
Maps: Johnston's Map of, and Surrounding Countries, 469; South African Republic, by E. Stanford, 349; South African Republic, The, by Africanus, 682 †
Transylvania, Photographs of, by Dr. Lóczy, 592
Travellers, Health Exhibition for, 671
Triangulation, Earliest, Vienna the Site of the, Herr S. Wellisch on, 203; Triangulations for road surveying in British East Africa, 284–289
Trinidad—
Oceanic Deposits of, by Harrison and Jukes-Brown, 342 †
Trinidad, its Capabilities and Products, by Sir W. Robinson, 342 †
Tripoli, Trade of (Foreign Office Rep.), 583 †
Tronador, Mount, Andes, 363, 364
Tropics—
Siedelung in den Tropen, von G. Meinecke, 466 †
Truck, S., Der Jäderin'sche Basis, 232 †
True, Dr., The Scientific Study of Irrigation, 589 †
Tsinan-fu city, Shantung, 207
Tung-ting lake, 640
Tunis—
La Tunisie, par M. Dubois, 228 †
Trade and General Progress in (Foreign Office Rep.), 583 †
Trebbiatrice guernita . . . nella Tunisia, del Prof. Giglioli, 338 †
Tunisia—
And the Modern Barbary Pirates, by H. Vivien, 682 †
Bizerte et Ferryville, 682 †
Turkana tribe, 319
Turkestan and Tibet, Ethnography of, 91
Turkwell river, Central Africa, 149, 151
Turley, R. T., Through the Hun Kiang Gorges, etc., 292 *
Turtles, The Geographical Distribution of, by Dr. J. Palacky, 123 †
Tyndall, J., Hours of Exercise in the Alps, 109 †
Tyndall, Lake, Patagonia, 256
Typhoons—
Die Taifune vom Sept. 1897, von Dr. Bergholz, 114 †
Tyrrell, J. B., Natural Resources of the Barren Lands of Canada, 119 †

U.

Udden, J. A., The Mechanical Composition of Wind Deposits, 234 †; note on, 215
Uganda—
From the Punjab Frontiers to, by Lieut. Vaughan, 119 †
Journeys to the North of, by Colonel Macdonald, 129 *, 681 †
Mombasa-Victoria (Uganda) Railway Committee, Report by the, 583 †
Papers relating to Events in the Uganda Protectorate, 119 †
Railway, Report on the, by Sir G. Molesworth, 209, 338 †
Uganda Protectorate and its Relation to the Sudan, by H. R. Fox Bourne, 119 †
Uhlig, Dr. K., Die Veränderungen der Volksdichte im nördlichen Baden, 222 †; note on, 89
Ukerewe island, Victoria Nyanza, 321
Ulloa, Señor, on the first discovery of the Madre de Dios, 447
Under the African Sun, by W. J. Ansorge, 117 †
United Kingdom—
British Isles through an Opera Glass, by C. M. Taylor, 677 †
British Rainfall, 1898, by G. J. Symons and H. S. Wallis, 678 †
British Scenery, Development of, by J. E. Marr, 333 †
Coal Supplies, Our, by T. F. Brown, 113 †
Commercial Geography of the British Isles, by A. J. Herbertson, 677 †
Erratic Blocks of the British Isles, 332 †
Ethnographical Survey of the United Kingdom, 332 †
Imports, Excess of, by Sir R. Giffen, 113 †
London Topographical Society, Report of the Organizing Committee, 677 †
Meteorological Council, Report of the, 333 †
Meteorological Observations at Stations of the Second Order, 224 †
Mines and Quarries, General Report and Statistics, 333 †
Photographs of Geological Interest in the United Kingdom, 332 †
Pressure, Winds and Rainfall over the British Islands, by A. J. Herbertson, 579 †
Thorough Guide Series: The Peak District of Derbyshire and Neighbouring Counties, 677 †
United States—
Agriculture, Department of, Yearbook, 339 †
Army, Annual Report of the Major-General of the, 683 †
Census, Twelfth, 322
Coast and Geodetic Survey, Magnetic Work of the, by L. A. Bauer, 461 †

United States—*continued.*
Diamond Field of the Great Lakes, by W. H. Hobbs, 461 †
Eastern Gateway of the, by Prof. Brigham, 340 †
États-Unis d'Amérique et leur extension en 1899, par P. Barré, 461 †
Geological Survey, Annual Report of the, 339 †, 683 †; Fossil Medusæ, by C. D. Walcott, 229 †
Hydrographic Charts, 128, 239, 469
Interior, Department of the, Annual Reports of the, 339 †
Irrigation, Reservoirs for, by J. D. Schuyler, 340 †
Jared Sparks and Alexis de Tocqueville, by H. B. Adams, 340 †
Magnetic Survey of the, by Dr. H. S. Pritchett, 339 †
Mineral Resources of the, Annual Report, 340 †
National Museum, Report of the, 229 †
Naval Observatory, Report of the Superintendent, 340 †
Original Territory of the, by Hon. D. Hill, 120 †
Public Domain of the, by Max West, 341 †
Stream measurements, Report of progress of, by A. P. Davis, 341 †
Timber Line, The, by H. Gannett, 229 †
War Department, Annual Reports of the, 461 †
Western, Increase of Aridity in the, Mr. Leiberg on, 212
Ural—
Om de vid syenitbergarter bundna jernmalmerna i östra Ural, af A. G. Högbom, 577 †
Urdu, Ibn Batuta's Travels, translation into, 672
Urmi, Lake, and its Neighbourhood, Contributions to the Geography of, by R. T. Günther, 504 *
Ushant—
Ouessant (Enez Heussa — L'Ile de l'Épouvante), par P. Gruyer, 453 †
Urhba, by W. R. Rickmers, 680 †
Ustun or Arka Tagh, 442

V.

VACATION Days in Hawaii and Japan, by C. M. Taylor, 125 †
Vaksh river, Bokhara, 601, 602
Valais, Contribution à l'éthnographie du, par E. Pitard, 224 †
"Valcavado" early maps, 625
Valley Floors, Grade of, 488; valley Sides, Development of, 494
Valparaiso and District, Trade of (Foreign Office Ann.), 462 †
Vancouver Island, by A. Begg, 583 †
Vancouver's explorations in Alaska, 526, 533
Van den Broeck, E., Phénomène de la Migration, 123 †
Van den Plas, J., Le Mayumbe, 336 †
Van der Kemp, P. H., De teruggave der Nederlandsche factorijen in Hindostan, 225 †
Vannutelli e Citerni, La seconda spedizione Bòttego nell' Africa Orientale, 117 †
Vasco da Gama—
Premier Voyage de Vasco da Gama aux Indes, par C. Ceulemans, 235 †
Vasco da Gama, von Dr. F. Hümmerich, 235 †
Vasco da Gama and his Companions, by A. G. Wright, 588 †
Vasco, G., Soudan Français: Le Massacre de la Mission Cazemajou, 227 †
Vasconcellos, S. de, Descripção da Bahia de Todos os Santos, 462 †
Vaughan, Lieut., From the Punjab Frontiers to Uganda, 119 †
Vecqueray, —, Trade of Consular district of Cadiz, 577 †
Venetia—
Valli de la Vénétie, par Thorndike-Nourse, 455 †
Venezuela—
Ludwigs Reisen in Coro, von W. Sievers, 121 †
Photographs of, by Major Paterson, 240
Venezuelan boundary arbitration, 594
Venice—
Ancora della Linea . . . e al territorio Veneto, del Prof. Bertolini, 223 †
Reading List on, by H. Sperry, 331 †
Verde, Cape, Submarine gully off, 395, 401, 402
Vermersch, Dr. A., Le Zuyderzée, 675 †
Verner, Mr., on Lakes of the Kasai basin, 211
Vernon-Harcourt, L. F., The Bruges Ship-Canal, 330 †, 674
Verpent, Les Caveaux de, par M. Galimard, 222 †
Vesuvius: a Note on the Eruption of September, 1898, by T. Anderson, 223 †
Veth, Dr. P. J., Catalogue de la Bibliothèque de, 466 †
Viala, L. F., Considérations économiques sur le Brésil, 121 †
Victoria—
Abstract of the Statistics of, 586 †
Cloud Observations in, by P. Baracchi, 586 †
Victoria Land, Antarctic Regions, 9, 474, 475
Victoria Nyanza—
Geologische Aufbau des deutschen Westufers des, von H. Herrmann, 583 †
Herrmanns, Aufnahme zwischen dem Victoria Nyanza und dem Kagera, 460 †
Vidal-Gormaz, Lake, Patagonia, 361, 364
Viedma, Lake, Patagonia, 262
Viellerobe, A., Hautes régions des Amazones, 342; explorations on the Madre-de-Dios, 214

Vienna the Site of the Earliest Triangulation, Herr S. Wellisch on, 203
Vienna, University of, Festival of the Geographical Association at, 659
Virchow, R., Die Bevölkerung der Philippinen, 335 †; Ueber die ethnologische Stellung der . . . Aegypter, 336 †
Viscachas river, Patagonia, 258
Vivian, H., Tunisia and the Modern Barbary Pirates, 682 †
Vivien de Saint Martin et Schrader, MM., Atlas Universel de Géographie, 239, 349
Vizagapatam, Meteorology of, by W. A. Bion, 115 †; Report . . . of the G. V. Juggarow Observatory, 579 †
Volcanoes of the Aleutian Islands, Mr. Stanley-Brown on, 567
Volz, Dr. W., Hausbau . . . den Battakern in Nordsumatra, 335 †
Von Hauer, Franz R., obituary of, 218
Vosges et le Jura, A travers les, par E. Cantineau, 452 †
Voulet, Captain, expedition in French Sudan, 320
Voulet-Chanoine, Mission, par Cap. Chanoine, 459 †

W.

Wachs, A., Die Etappenstrasse von England nach Indien, 690 †
Wad Medani, Sudan, 208
Wagner, H., Die Grösse der britischen . . . in Hinterindien, 225 †; Geographisches Jahrbuch, 237 †
Wakaramojo, Central Africa, 136
Walcott, C. D., United States Geological Survey, Fossil Medusæ, 229 †
Wallace, T. D., Geological Notes on Strathdearn and the Aviemore Railway, 579 †
Walls y Merino, M., Primer viaje alrededor del mundo por el A. Pigafetta, 688 †
Ward, C. S., Thorough Guide Series, The Eastern Counties, 332 †
Warren, Sir C., The Ancient Standards of Measure in the East, 465 †
Warwickshire, Handbook of, by John Murray, 113 †
Wasave tribe, Central Africa, 134
Washington, Catalogue of Mammals from the Olympic Mountains in, by D. G. Elliot, 684 †
Water-spouts on the Coast of New South Wales, by H. C. Russell, 345 †
Waters, Lieut.-Colonel, The Trans-Siberian Railway, 116 †
Watt, J. A., Notes on the Occurrence of Bismuth Ores in New South Wales, 121 †; Report on the Wyalong Gold-Field, 463 †
Wauters, A. J., La Vingt-Deuxième traversée de l'Afrique Centrale, 226 †
Weather Bureau Officials, Proceedings of the Convention of, edited by J. Berry, 465 †. 587 †
Weatherley, Mr., explorations in the Bangweolo Region, 319, 561
Webster, H., Samoa: Navigators Islands, 464 †
Weddell sea, Antarctic, 477
Weed, W., and L. Pirsson, Geology . . . of the Judith Mountains of Montana, 340 †
Wei-hai-wei: its Value as a Naval Station, 334 †
Weisgerber, Dr., journey in Marocco, 564
Weissenfels, Cape, drift-sand flora of, 167
Wellby, Captain, explorations in the Lake Rudolf Region, 318; and Lieut. Malcolm, Road Report of Route across Tibet and China, 457 †
Wellisch, Herr S., on Vienna the Site of the Earliest Triangulation, 203
Wellman, W., Arctic Expedition of, 326
Weltmeeres, Bodenformen des, von A. Supan, 688 †
West, M., The Public Domain of the United States, 341 †
Westermarck, Prof. E., Finland and the Czar, 112 †
West Indies—
Admiralty surveys in the, 84
History of the Islands, etc., by A. K. Fiske, 121 †
Hurricane of 1898, by Captain Carpenter, 230 †; Correspondence relating to the, 121 †
Hurricane of, Aug. 1899, by E. B. Garriott, 685 †
Westman, J., Gletscher von Sulitelma und Ålmajalos, 676 †
Westport Harbour in New Zealand, Wave Basin, by T. H. Rawson, 464 †
Weule, Dr. K., Der Afrikanische Pfeil, 680 †
Wharton, Sir W., Report on Admiralty Surveys, 343 †
Wheat—
Address by Sir W. Crookes, 346 †
Weizenproduction der Erde, von F. Heiderich, 688 †
White, A. S., The Expansion of Egypt under Anglo-Egyptian Condominium, 681 †
White, R. B., Brief Notes on the Glacial Phenomena of Colombia, 684 †
Whitehead, Ch., a Sketch of the Agriculture of Kent, 677 †
White island, or Giles Land, 170
Whittle, J. L., Egypt after Omdurman, 336 †
Whymper, E., Chamonix and the range of Mont Blanc, 577 †; The Valley of Zermatt and the Matterhorn, 677 †
Wiche's Land, 155; memorandum on, by Sir C. Markham, 177
Wichmann, A., Der Wawani auf Amboina, 225 †
Wieser, F., A. E. v. Nordenskiöld's Periplus, 689 †

Wissenburg, A., Die Wirthschaftsverhältnisse Ostasiens, 114 †
Wilcox, W. D., A certain type of Lake Formation in the Canadian Rocky Mountains, 339 †; Sources of the Saskatchewan, 120 †
Wild, H., Ueber die Bestimmung der erdmagnetischen Inklination, 346 †
Williams, C. J. R., Floods in the Brisbane River, 464 †
Willis, B., Some Coal-fields of Puget Sound, 341 †
Willoughby, H. L., Across the Everglades, 120 †, 212
Willoughby island, Alaska, 529
Wilmot, A., letter from, on the Ancient Ophir, 220
Wilson, M. C., Reading List of Colonial New England, 340 †
Wilson, Sir C. W., remarks on "Road-making and Surveying in British East Africa," 290, 291
Wilts and Dorset, Handbook by J. Murray, 677 †
Wind—
Anenometers, Report on Experiments upon the exposure of, by W. H. Dines and Captain Wilson-Barker, 233 †
Directions in the antarctic, 419
Estimated Wind Force, by Captain Wilson-Barker, 233 †
Mechanical Composition of Wind Deposits, by J. A. Udden, 234 †; note on, 215
Windward, voyage of the, 326; return of the, 448
Wingate, Captain, Recent Journey from Shanghai to Bhamo through Hunan, 639 *
Winkel, Dr. J. te, De Noordnederlandsche tongvallen, 223 †
Winnipegosis, Chez les Sauteux du lac, par R. Goelen, 691 †
Winter Minima on British Mountain Tops, 113 †
Winter Temperature and the Height of the Barometer, Connection between, by W. H. Dines, 233 †
Winton, Sir F. de, remarks on "Road-making and Surveying in British East Africa," 290
With Nature and a Camera, etc., by R. Kearton, 224 †
Wodena, von A. Struck, 224 †
Woodward, Dr. H., remarks on "Explorations in the Bolivian Andes," 32; remarks on "Explorations in Patagonia," 374
Worcester and Bourns, Messrs., A List of the Birds known to inhabit the Philippine Islands, 226 †
Workman, F. B., Ascent of the Biafo Glacier and Hispar Pass, 579 †
Wright, A. J., Vasco da Gama and his companions, 588 †
Wright, Marie R., Picturesque Mexico, 120 †
Wuchow, Trade of (Foreign Office Ann.), 457 †
Wu-nu Shan mountain, 297
Wüstungen im und am Kliekener Luch, von Prof. Weyhe, 577 †
Wyndham, —, Trade of Chicago and District, 584 †

Y.

Yakh-Su valley and district, 602, 603
Yalu trade, 298–300; river, 299
Yang-tse, Haut, La Navigation à Vapeur sur le, par R. Chevalier, 316, 334 †
Yang-tse-kiang, Mouth of the, and Surrounding Country, Map of, by E. de Cholnoky, 349
Yangtse Region, by R. C. Gundry, 678 †
Year-Book of the Scientific Societies, 347 †
Yelcho, Rio, Patagonia, 324
Yellowstone, Piracy of the, by J. P. Goode, 341 †
Yemen, Une excursion au, par Désiré Charnay, 224 †
Yokohama and District, Trade of (Foreign Office Ann.), 580 †
Yola town, Benue region, 630
Yorkshire, Caves and Pot-Holes of, by S. W. Cuttriss, 578 †, 658
Younghusband, Major, The Philippines and Round About, 116 †
Yuan river, 642
Yucatan, Trade of (Foreign Office Ann.), 120 †
Yuen-liang-ho, Shantung, 206
Yunnan—
Chemin de fe français au Yunnan, par C. Madrolle, 457 †

Z.

Zahler, Dr. H., Die Krankheit im Volksglauben des Simmenthals, 578 †
Zambezi, expedition of Major Gibbons to, 93
Zanue hills, Niger Protectorate, 180
Zeilah au Harar, De, par Dr. L. de Castro, 583 †
Zermatt, Valley of, and the Matterhorn, A Guide, by Ed. Whymper, 677 †
Zimmerer, Dr., Der Photocol-Sammel-Atlas, 236 †
Zimmerman, Dr. A., Die Kolonialpolitik Grossbritanniens, 124 †
Zimmerman, M., Résultats des Missions Blondiaux et Eysséric, 337 †
Zöppritz, Dr., Leitfaden der Kartenentwurfslehre, 122 †
Zulukaffern, Middlebrooks Photographieen aus dem Leben der, 118 †
Zuyderzée, Le, par Dr. A. Vermersch, 675 †
Zweck, Dr. A., Litauen, eine Landes- und Volkskunde, 222 †

INDEX TO MAPS.

ASIA.

Bokhara, Sketch-map of, 696
Chinese Shan States, from drawing by F. W. Carey, 472
Manchuria, Central and Southern, compiled from R. Turley's observations, 352
Shanghai to Bhamo, Route-map from, 643
Urmi Lake Basin, by R. T. Günther, 592

AFRICA.

Bauchi, Kingdom of, Sketch-map of, by P. A. Clive, 178
Benue River, Western district of the, Sketch-map, 696
British East, Road-Making and Surveying in, by Captain Smith, 352
Juba River, Course of, Sketch-map of the, 696
Ngami, Lake, Region of, Sketch-map, 311
Uganda Protectorate, showing routes of Macdonald Expedition, 240

AMERICA.

Alaska, South-Eastern, Glaciers of, 592
Argentina, Southern, Sketch-map of, 352
Argentine-Chilean Boundary, Northern, Sketch-map of, 323
Cordillera Real, West Slope of the, Plane-table Sketch-survey, 128
Port des Francais, North-West America, Plan of, 592

ARCTIC.

Bear Island, from survey by Kjellström and Hamberg, 55
Buchanan Bay, etc., of Grinnell Land, Sketch-map by Lieut. Peary, 592
King Charles Land, Sketch-map, 69–76; Ditto, from a survey by Kjellström and Hamberg, 128
Spitsbergen, showing course of *Antarctic* in 1898..61; Purchas's Map of, 157

GENERAL.

Antarctic Strait, Soundings in, 78
Oceanographical Research, International, Chart showing proposed regions for, 647
Oceans, Bottom and Surface Temperatures of the, Three Maps illustrating, 128
Oceans, Bathymetrical Chart of the, showing "Deeps" according to Sir J. Murray, 472
Sea Bottom, Contour of, two charts of, 472

ILLUSTRATIONS AND DIAGRAMS.

ASIA.

Bokhara—
- Balgnan, 597
- Barrier, A, 615
- Dandushka-Bend, 607

Bokhara—*continued.*
- Gorge, A, 609
- Hazrat-Ishan, 613
- Ruy Dascht, on the Safet-Darya, 604

Bokhara—*continued.*
Safet-Darya, Russian colony of, 605; Safet-Darya valley, 611
Yakh-Su valley and conglomerate mountains, 599; Yahh-Su, Side valley of the, 601
Chinese Shan States—
Manhao, 386
Red river, The great rapid, 380; Red river at Hsiukai, 381
Sumao from the west, 387; South Gate street in Sumao, 392
Suspension bridge over the Ho-ma river, 383; Suspension bridge over the Papien river, 385
Chinese Shan States—*continued.*
Temple near Sumao, 389
Tibetans in market at Sumao, 391
Yuan Chiang valley, View of, 379
Urmi, Lake, district—
Ardishai, Main street, 507
Bridge over the Safi Chai, 518
Sunnite tower, Salmas, 509
Tomb of mother or daughter of Hulagu, 519
Urmi, Lake, View of, from Koyun Daghi, 514
Urmi, Plain of, Panoramic view of, 511

AFRICA.

Uganda—
British East, Captain Smith's Triangulation, 281
Karamojo head dress, 145
Kavirondo chief, 139
Lubwa's, Embarkation at, 143
Uganda—*continued.*
Nandi, View in, 135
Solian, Camp at, 147
Station on the Uganda railway, 131
Usoga, View in, 141

AMERICA.

Alaska—
Brady glacier, 533
Johns Hopkins glacier, Panorama of, 527, 529
Lituya bay, Looking northward of, 531
Muir glacier, Panorama of, 525
Bolivia—
Cacaaca, Mount, from near Milluni mine, 21
Cusanaco mine, Gorge near, 24
Earth pyramids in La Paz valley, 23
Illimani, from near Caimbaya, 25; Illimani and the Pico del Indio, 27; Top of Illimani, 29
Sorata, Mount, from the Puna, 19
Titicaca, Lake, A Balza on, 17
Patagonia—
Araucaria imbricata, Wood of, 371
Argentino, Lake, Western arm of, 253
Belgrano, Lake, Ancient eastern outlet of, 259
Patagonia—*continued.*
Buenos Aires, Lake, Marble islands at the, 265
Continental divide in the glacial deposits of river Viscachas, 247
Cordillera of the Andes, Eastern slope of the, 243; North-west and west of, 257
Fenix, River, 355
Lanin volcano, 367
Las Heras river, Mouth of the, 261; Rapid in the, 263
Mylodon cave near Last Hope inlet, 245
San Martin, Lake, Ancient eastern outlet of, 255
Santa Cruz, River, 251
San Tadeo peninsula, at Lake Nahuel-Huapi, 359
Tronador, Mount, 363
Vidal-Gormaz, Lake, 361
Volcanic tuff at river Limay, 365

ARCTIC.

Bear island, southern extremity, 56; the Burgomaster Gate, 57
Spitsbergen—
Amsterdam Island, Shore of, covered with driftwood, 175
Andrée's balloon house, Remains of, 173
Auk Horn, in Safe Haven, 64
Charles XII. island, 172
Giles Land, or White island, 171
Spitsbergen—*continued.*
Hope island, East side of, 60
King Charles Land, 67–73
Nordenskjöld, Mount, on Swedish Foreland, 161
Sjögren, Mount, from Cape Altmann, 162
Storfjord, Western shore of the, 62
Tordenskjöld, Mount, from Cape Altmann, 163

ANTARCTIC.

Antarctic strait and soundings in the pack, 78, 79; method of sounding, 80
Barometric pressure diagrams, Figs. 1–3, 414–416

GENERAL.

Beatus Maps, Pedigree of the, 624
Geographical Cycle, Figs. 1–3 illustrating the, 486, 492, 494
Submarine gullies, etc.—
  Fosse de Cap Breton, 405, 406
  Garonne, Subterranean course of the, 407
  Lines of soundings from Cape Verde, 396
Submarine gullies, etc.—*continued.*
  Profile sections across gully at Cape Verde, 399
  Rovuma bay, Soundings, 397
  Salinas landing, Contour of sea-bottom, 411
  Section to true scale across gully, 400
  "Swatch of No Ground," 410

END OF VOL. XIV.

PRINTED BY WILLIAM CLOWES AND SONS, LIMITED, LONDON AND BECCLES.